Virginia Deer Management Plan 2006-2015

Wildlife Division

Virginia Department of Game and Inland Fisheries

EXECUTIVE SUMMARY

White-tailed deer (*Odocoileus virginianus*) garner more interest than any other wildlife species in Virginia. Many Virginians relish the chance to hunt, watch, or photograph this graceful mammal. Deer hunting is a deeply-rooted social tradition in Virginia. The economic impact of deer hunting in Virginia is over $250 million annually. However, as the largest wild herbivore (plant-eater) in the Commonwealth, deer have a profound impact on forest ecosystems. Deer also inflict millions of dollars in damage to crops, trees, and gardens and are a safety risk on our highways.

Deer were plentiful and widespread when Jamestown was settled in 1607. By 1900, over-harvest of deer for food and hides had nearly extirpated the species. Since the 1930s, Virginia's deer population has rebounded as a result of protective game laws, restocking of deer into areas where they were absent, and land use changes. Since the early 1990s, deer management objectives have switched from restoring and increasing to controlling and stabilizing populations over much of the Commonwealth.

Under optimal conditions, a deer population can double in size annually. With no regulating factor (e.g., predators, hunters), a deer population would expand to the point where some resources, generally food, would become scarce. Deer have few natural predators in Virginia, and other sources of mortality (e.g., diseases, injuries) are not sufficient to control populations. Active deer management is necessary to maintain deer populations at optimum levels to meet the needs of citizens of the Commonwealth. An optimum deer population balances positive demands (e.g., hunting, viewing) with negative demands (e.g., agricultural damage, vehicle collisions, ecosystem impacts). The Virginia Deer Management Plan identifies areas where deer populations should be managed to increase, decrease, or remain the same.

The first Virginia Deer Management Plan, completed in 1999, was revised during 2005-2006 through the involvement of stakeholders and managers of deer. Biological principles continue to play a major role in the success of deer management programs, but meaningful stakeholder involvement is also necessary. Although VDGIF has traditionally incorporated public input into deer management decisions, it was not until development of the first Virginia Deer Management Plan in 1999 that a diverse cross section of stakeholders formally participated in a process to establish direction for deer management. Because VDGIF's mission is "to serve the needs of the Commonwealth," the processes used to develop and revise the deer plan incorporated public values (e.g., economic, sociological, and political) and biological considerations.

The Deer Management Plan is intended to embody the interests of all Virginians. Deer stakeholders focused on making value choices about deer management, while wildlife professionals focused on the technical aspects. A 17-member Stakeholder Advisory Committee (SAC) represented a cross section of stakeholders: homeowners, sportsmen, nonconsumptive interests, agricultural producers, commercial timber industry, zoos, and resource management agencies. The SAC was responsible for identifying the goals that should drive deer management. VDGIF staff with technical expertise in deer management designed objectives and strategies based on values identified by the SAC. Additional public values were considered via stakeholder surveys and advertisement of the draft plan for broad public review. Deer experts external to VDGIF provided a technical review of the draft plan. The final draft was presented to the VDGIF Board of Directors on _____ and approved.

The revised Virginia Deer Management Plan will guide deer management across the Commonwealth through 2015. This plan describes the history of white-tailed deer management, current status (supply and demand) of the deer resource and management programs, and the future of the deer management program in Virginia. The plan identifies a framework of what needs to be done, how it should be done, and when it should be done. Guided by the VDGIF mission statements, the Virginia Deer Management Plan includes 4 goals which specify the general directions for: (1) deer populations, (2) deer habitat, (3) deer damage, and (4) deer-related recreation. Specific objectives help guide the attainment of each goal. Preferred strategies then clarify how each objective should be achieved. By clarifying goals and directions of deer management, this plan will assist the VDGIF Board of Directors, VDGIF administrators and staff, and the public in addressing deer issues.

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INTRODUCTION

Public attention to white-tailed deer arguably is greater than the interest exhibited for any other species of wildlife in Virginia. As Virginia's most popular game species, other implications of white-tailed deer range from welcomed public viewing opportunities to serious damage and public safety concerns. Divergent citizen interests associated with white-tailed deer provide unique management challenges for the Virginia Department of Game and Inland Fisheries (VDGIF).

The VDGIF, under the direction of a Governor-appointed Board of Directors, is charged specifically by the General Assembly with the management of the state's wildlife resources. The Board and VDGIF are given many legal mandates throughout the Code of Virginia. The agency's primary functions include management of the wildlife resources (§29.1-103), public education (§29.1-109), law enforcement (§29.1-109), and regulatory powers (§29.1-501). In 1990, the Board of Directors adopted mission statements to help clarify and interpret the role of the VDGIF in managing the wildlife resources of Virginia. They are:

> *To manage Virginia's wildlife and inland fisheries to maintain optimum populations of all species to serve the needs of the Commonwealth;*
>
> *To provide opportunity for all to enjoy wildlife, inland fish, boating, and related outdoor recreation; and*
>
> *To promote safety for persons and property in connection with boating, hunting, and fishing.*

What the Virginia Deer Management Plan Is

The Virginia Deer Management Plan describes the history of the deer management program, its current status (supply and demand), and the future direction or emphases it likely will take. The plan establishes a framework through 2015 of what needs to be done, how it should be done, and when it should be done. By clarifying management goals and objectives of the VDGIF relating to deer, this plan will help Board members, VDGIF administrators, VDGIF staff, and the public to effectively address deer issues. As the basis for white-tailed deer management budgeting and yearly operational activities, the plan also informs the General Assembly and the public of what the VDGIF intends to accomplish.

How the Plan was Developed

The first deer management plan was developed between 1996 and 1998, and hereafter will be referred to as the 1999 Deer Plan. This plan was developed to represent the interests of all citizens, not just select groups (including the VDGIF). It evolved as a composite of contributions from citizens, business interests, resource professionals, and recreationists. The 1999 Deer Plan represents the first time the public's interests were incorporated so thoroughly into the planning process from the outset in Virginia.

To ensure that the plan would represent all citizens and help the VDGIF respond effectively to deer management needs, a Deer Management Planning Committee was created in 1996. The Committee, which met 5 times between January 1996 and August 1997, was comprised of a diverse cross section of citizens who possessed expertise and/or an interest in deer management issues (see Appendix 1 in the 1999 Deer Plan). This Committee realized early on that input from local residents was essential to the development of a meaningful plan, so 6 regional meetings were conducted throughout the state and involved 135 participants (see Appendices II-VII in the 1999 Deer Plan).

To solicit public comments, nearly 50,000 copies of a condensed 4-page newspaper version of the draft deer management plan and 300 copies of the unabridged plan were distributed throughout Virginia during December 1997. Numerous articles about the deer management plan also were published in local newspapers across the Commonwealth. Based on comments received, the Committee voted to change population objectives for certain counties and to prioritize all plan objectives. The revised draft plan was presented to and endorsed by the VDGIF Board at their July 1998 meeting.

The original 1999 Deer Plan was due for revision in 2004 and the process to revise the plan began during 2005. Like the original planning process, revision incorporated value choices made by diverse stakeholders with technical guidance from wildlife professionals. Key accomplishments of the revision were updating technical chapters (data, programs, etc.) and involving a Stakeholder Advisory Committee (SAC, Appendix 1) to significantly revise goals, objectives, and strategies of the plan. The Committee met 3 times between April and November 2005, but remained active via email review into the summer of 2006. To broaden input, we solicited citizen opinions about deer management through a student-parent education initiative, surveyed county administrative officials about deer population levels, presented draft population objectives to hunters during the biennial regulations review process, circulated draft technical chapters among professionals with technical expertise, and received public comments about the draft plan revision via the internet and in writing. The draft plan was approved by VDGIF Board on _____ ____.

Format

The revised Virginia Deer Management Plan includes updated sections on deer program history, deer program status (supply and demand), supporting documents, accomplishments of the 1999 Deer Management Plan, and deer program goals. Within the context of the VDGIF mission statement, deer management goals were drafted to address 4 key issue areas: populations, habitat, damage, and recreation. Specific objectives have been established for each of these goals to help guide their attainment, whereas preferred strategies clarify how each objective should be achieved.

Interim Changes to the Objectives and Strategies of the Plan

The revised Virginia Deer Management Plan is designed to provide guidance and priorities to help manage Virginia's deer population through 2015. However, the plan should be a dynamic and flexible tool which remains responsive to potential shifts in deer management needs. While goals should remain relatively constant over time, specific objectives and strategies need flexibility to respond to changing social, environmental, technical, and administrative conditions. To keep the plan relevant and responsive, specific objectives and strategies may be added, deleted, or amended by VDGIF as new circumstances demand. Recognizing the adaptive significance of corrective changes in management approaches, the SAC endorsed this flexibility in updating objectives and strategies between revisions. VDGIF staff will submit these interim updates to the SAC for review and comment before implementing changes.

Acknowledgements

For a plan representing the interests and values of Virginians, success depended on the meaningful involvement of stakeholders from throughout the Commonwealth. The commitment and enthusiasm provided by the Stakeholder Advisory Committee (Appendix 1) not only made a substantial difference in the quality of the final plan, but enriched the process throughout. Parents, high school students, and teachers participating in an education project provided valuable survey input. County/city administrative officials also completed surveys. Numerous citizens reviewed and commented on the draft plan.

Appreciation is extended for the work of VDGIF technical staff for summarizing and presenting a great deal of life history and management information. We also appreciate the valuable professional advice and reviews provided by Jennifer Cromwell (Virginia Assistant State Director, U. S. Department of Agriculture – Wildlife Services), Kent Kammermeyer (Senior Wildlife Biologist, Georgia Department of Natural Resources), Dr. Steve McMullin (Associate Professor, Department of Fisheries and of Wildlife Sciences, Virginia Tech), and Dr. James Parkhurst (Extension Wildlife Specialist and Associate Professor, Department of Fisheries and Wildlife Sciences, Virginia Tech).

DEER PROGRAM HISTORY

Introduction

White-tailed deer in Virginia have a remarkable and interesting history. Historical changes in deer distribution patterns, population trends, and management practices in Virginia are representative of those in many southeastern states. Deer herds at the time of European settlement around 1600 were plentiful and widespread. Over-exploitation during the next 300 years resulted in near extirpation of deer by the turn of this century.

When the first European settlers arrived in North America in 1607 at Jamestown Island, Virginia, they described an animal found in abundance, which would become known commonly as the Virginia white-tailed deer. Early records indicate that white-tailed deer were present statewide, but highest population densities occurred in the coastal Tidewater physiographic region.

The exact number of deer that inhabited the Commonwealth of Virginia at the time of European settlement is unknown, and estimates of Virginia's precolonial deer herd have not been established. However, one of America's foremost naturalists, Ernest Thompson Seton, estimated the deer herd in the eastern United States to be 10-20 deer per square mile at the time of European settlement. Seton's estimate, when applied to the land area of Virginia, equates to a pre-colonial population of 400,000-800,000 deer (Figure 1; A).

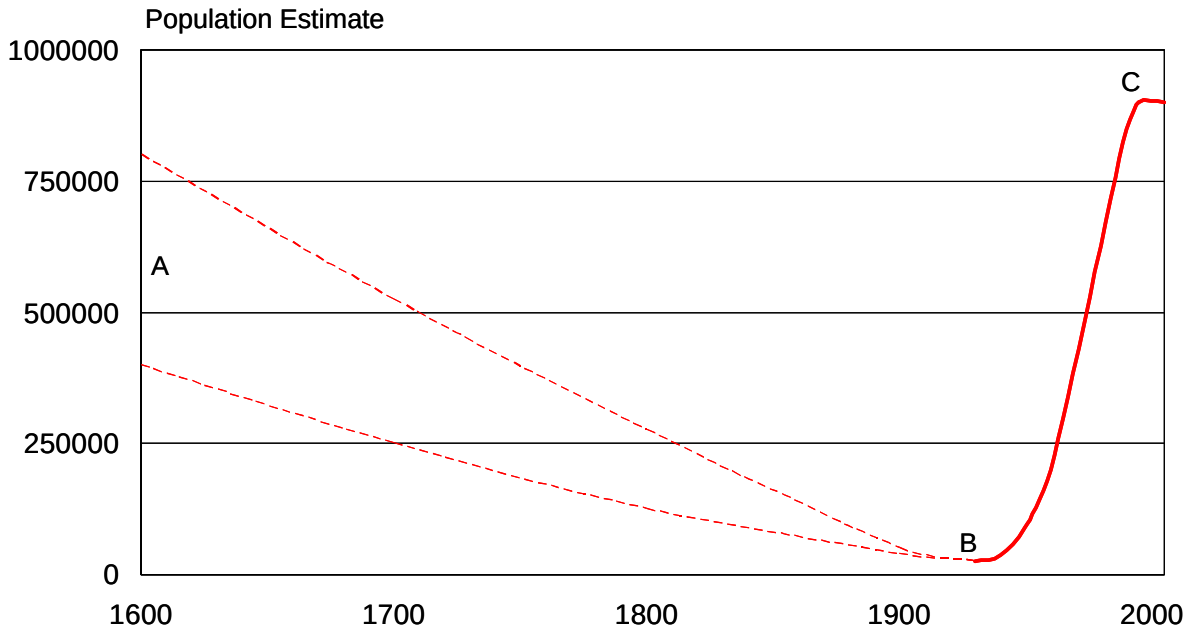


Figure 1. Hypothetical population curve for Virginia's deer herd, 1600-present.

Historical Changes in Distribution and Abundance

Deer Population Decline, 1600-1900. ----Following colonization, Virginia's deer population began to decline. Factors cited as reasonable causes for this decline are habitat loss due to deforestation and agriculture, over-harvest, and lack of effective law enforcement. Extensive over-harvest may have been the most damaging factor. Although clearing and conversion of forests to agriculture should have benefited Virginia's colonial deer herd, improvements in habitat conditions apparently were negated by continued over-harvest.

To rectify the decline in deer numbers, Virginia was one of the first colonies to establish in 1699 a closed season on hunting deer (from February 1 through July 31). By 1738, separate seasons had been established for bucks and for does and fawns.

The over-harvest of Virginia's deer resource was characterized by several distinct stages. During early European settlement, venison and deer hides were essential staples of everyday colonial life. Despite the potential harm likely to be inflicted on deer populations, nearly every law that was enacted by colonists to protect deer in Virginia exempted settlers living on the contemporary western frontier. As further evidence of the pioneers' dependence on deer as a source of food and clothing, it was not until 1849 that the deer season was closed completely in counties west of the Blue Ridge Mountains.

Commercial trade in deer hides, which peaked around 1700, added to the take from subsistence hunting. Between 1698 and 1715, approximately 14,000 hides were exported from Virginia to Europe annually.

The boom in market hunting followed the rise and fall of commercial trade in deer hides. One market hunter in northwestern Virginia was reported to have killed over 2,700 deer prior to 1860 at an average price of 10 cents per pound. Market hunting effectively ceased with the passage of the federal Lacey Act in 1900, which outlawed the buying and selling of wildlife take illegally and enhanced federal government control over the interstate transport of wildlife.

Like most southeastern states, Virginia's deer herd reached its lowest point during the early 1900s. By 1900, the deer herd in nearly all of Virginia's Mountain and Piedmont physiographic regions had been extirpated. In an article that appeared in the *Game and Fish Conservationist*, the precursor to today's *Virginia Wildlife*, the 1931 statewide deer population was estimated to be approximately 25,000 animals (Figure 1; B).

Deer Population Restoration.-----Exactly when deer numbers began to increase significantly in Virginia is unknown. One noted white-tailed deer authority suggested that, from a North American perspective, deer abundance did not increase significantly until the 1930s. The principal factors that contributed to the increase in deer populations in Virginia over the past 60-70 years were reforestation, farm abandonment, protective game laws, effective law enforcement, and restocking. The three latter factors now are the responsibility of the VDGIF.

After its formation in 1916, the Virginia Game Commission devoted considerable time and effort to deer management. Initial efforts to protect remaining deer herds included establishing shorter hunting seasons and imposing a season bag limit. Annual deer harvests during the 1920s averaged about 620 deer for all 33 counties that had open deer seasons. In 1924, the General Assembly restricted hunting to a 45-day buck-only deer season between November 15th and December 31st with a 1-deer per day, 2-deer per season bag limit.

In 1926, the Game Commission initiated a deer restoration program. Early records of this restoration effort are incomplete. In its early stages (1926-1950), 1,305 deer from out-of-state sources were imported to and released in Virginia. Historical records indicate that Virginia received deer from more states (11) than any other state in the Southeast (Figure 2). Although the average purchase cost for out-of-state deer was $50/deer, actual costs ranged from $25-$125/deer. The last deer imported to and released in Virginia was in 1950.

Following a slow start, the number of deer released per year peaked at 375 deer in 1940 (Figure 3). After a 4-year lull during World War II, restocking activities resumed at a moderate level for 10 years and averaged about 40 animals annually. During the 9-year period between 1958 to 1966, restoration efforts were suspended completely.

Nearly all the 1,980 deer stocked after 1967 came from a single source, the Radford Army Ammunition Plant(s) in Montgomery and Pulaski Counties. Restoration efforts conducted during the 1980s and 1990s (involving about 450 deer) were directed primarily at 2 far southwestern counties, Buchanan and Dickenson. Most restocking in Virginia occurred west of the Blue Ridge Mountains (Figure 4). In all, more than 4,200 deer were released.

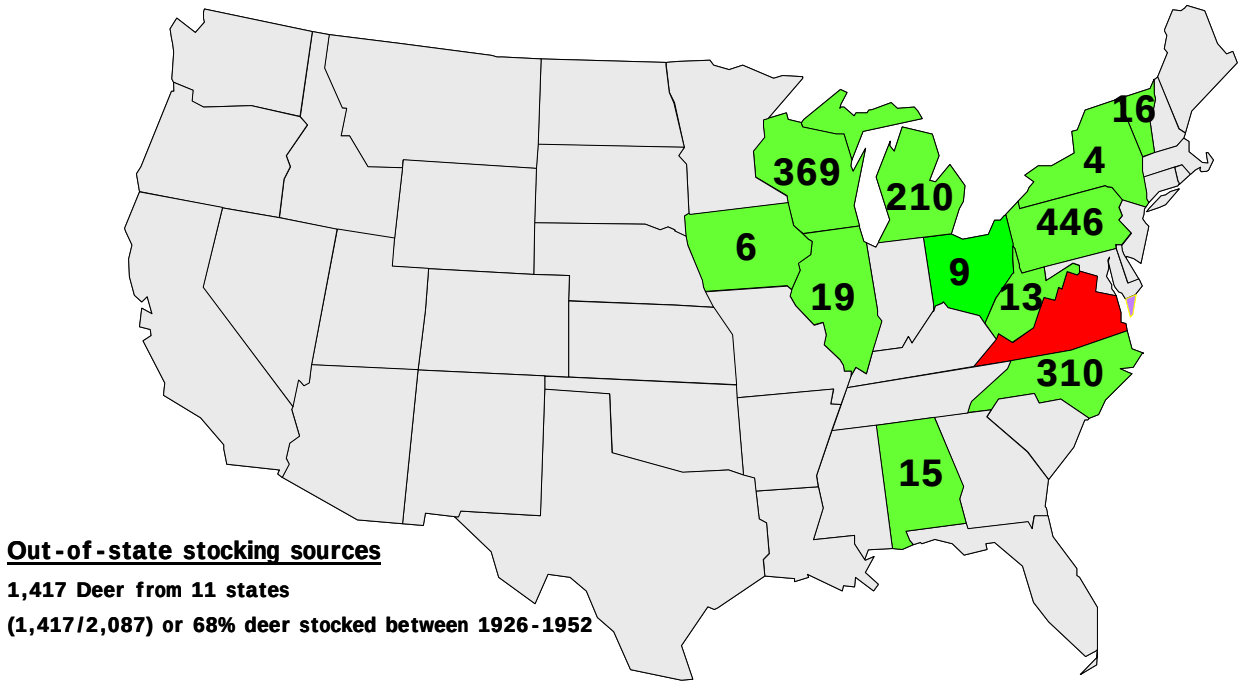


Figure 2. Source states for deer stocked in Virginia, 1926-1952.

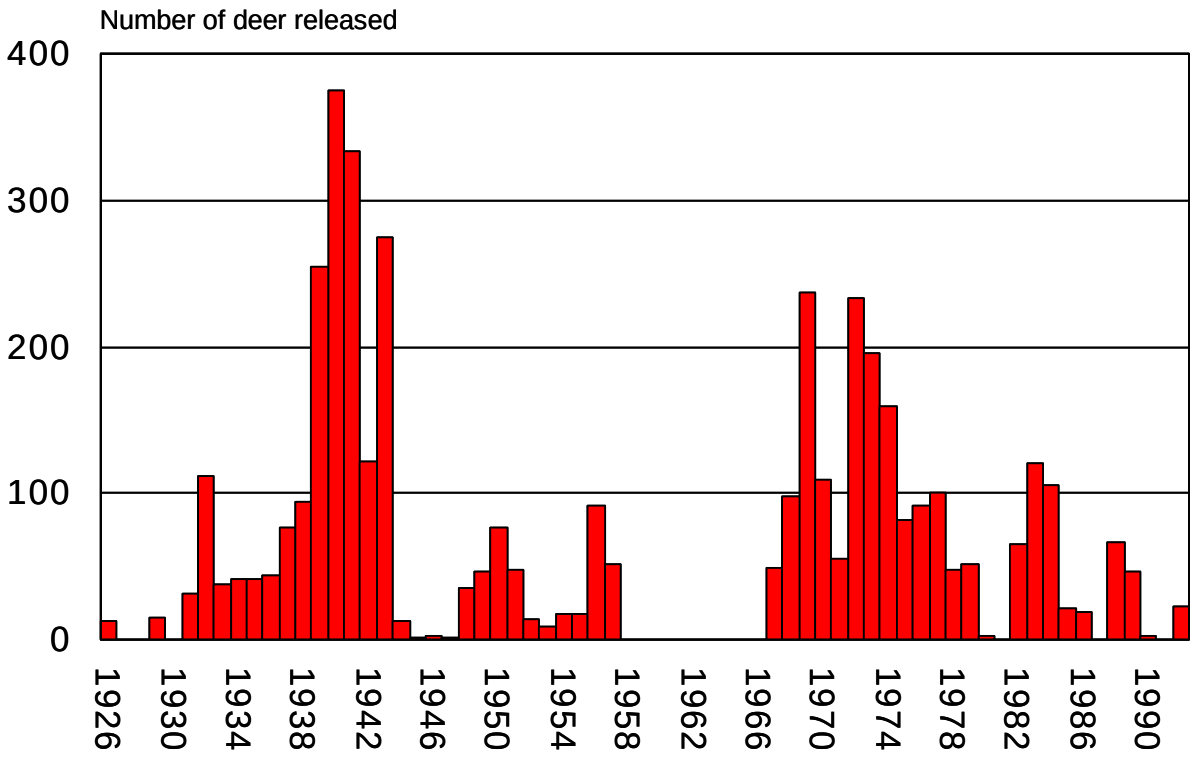


Figure 3. Virginia deer restoration, 1926-1992.

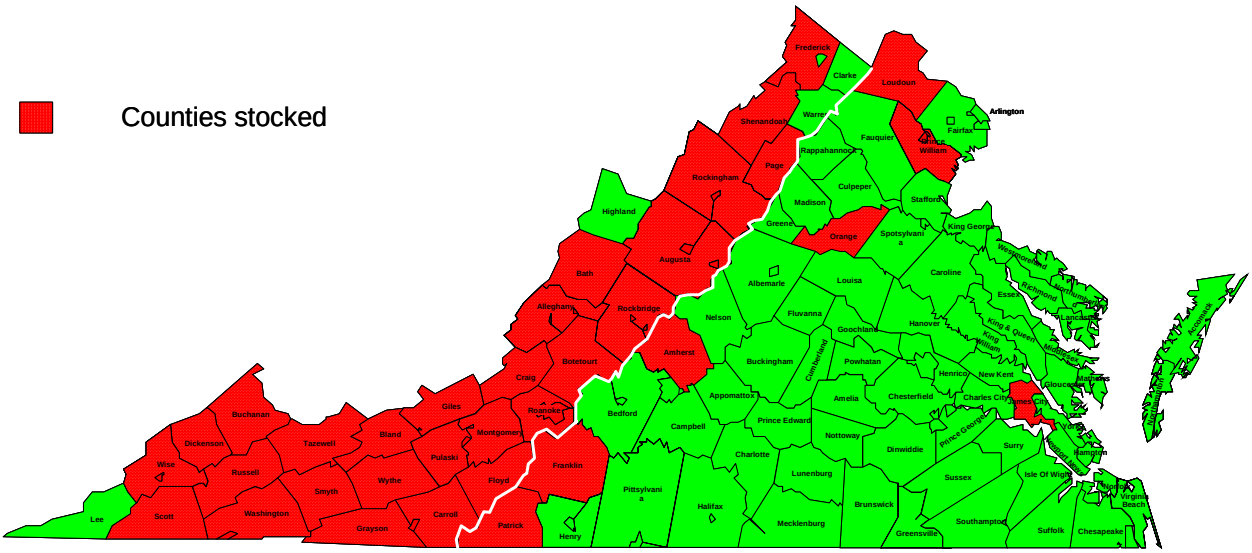


Figure 4. Virginia deer restoration, 1926-1992.

Deer Distribution Maps

1938.----In one of the first maps of deer distribution in Virginia (Figure 5), 3 distinct areas were described: areas with native deer herds, areas where deer were absent, and 22 locations of isolated deer populations attributed to the restocking effort. At a time when native deer were considered extirpated from nearly all of western Virginia (1920s), Bath and Highland counties were estimated at 500-2,500 deer. By far the largest contiguous area with native deer populations occurred in the coastal Tidewater region and extended into the central Piedmont. Over half of the state, consisting of most of the Mountain region and the northern and southwestern Piedmont, was described as devoid of deer.

Later changes in deer densities and distribution patterns are best demonstrated in a series of maps produced by the Southeastern Cooperative Wildlife Disease Study (SCWDS) at the University of Georgia. Over the years, SCWDS has produced a series of maps that document changes in deer distribution and relative abundance. These maps were prepared from data compiled by state game and fish biologists, and represented conditions in the southeastern United States in 1950, 1970, and 1980 and the entire United States in 1988.

1950.----The 1950 SCWDS map of Virginia designated locations of deer when intensive restoration began, but gave no indication of relative abundance (Figure 6). By 1950, Virginia had been conducting restoration efforts for nearly 25 years and had released approximately 2,000 animals. By the early 1950s, Virginia's statewide deer population was estimated to have expanded to 150,000 animals.

Like the 1938 map, the 1950 SCWDS map indicated that deer occupied a majority of the coastal Tidewater region and the central Piedmont, yet much of the southwestern and northern Piedmont remained unoccupied. Most of the south-central Piedmont lacked deer, with only isolated populations scattered throughout the area. West of the Blue Ridge Mountains, native and restocked deer herds in the northern Mountains had repopulated approximately 75% of the available range. Deer herds in the southern Mountains were depicted as isolated populations with vast areas of unoccupied range.

In 1952, the Virginia Game Commission initiated a statewide program to collect data on deer populations to help set appropriate seasons and bag limits. In 1953, the first full-time deer biologist was employed to direct this program.

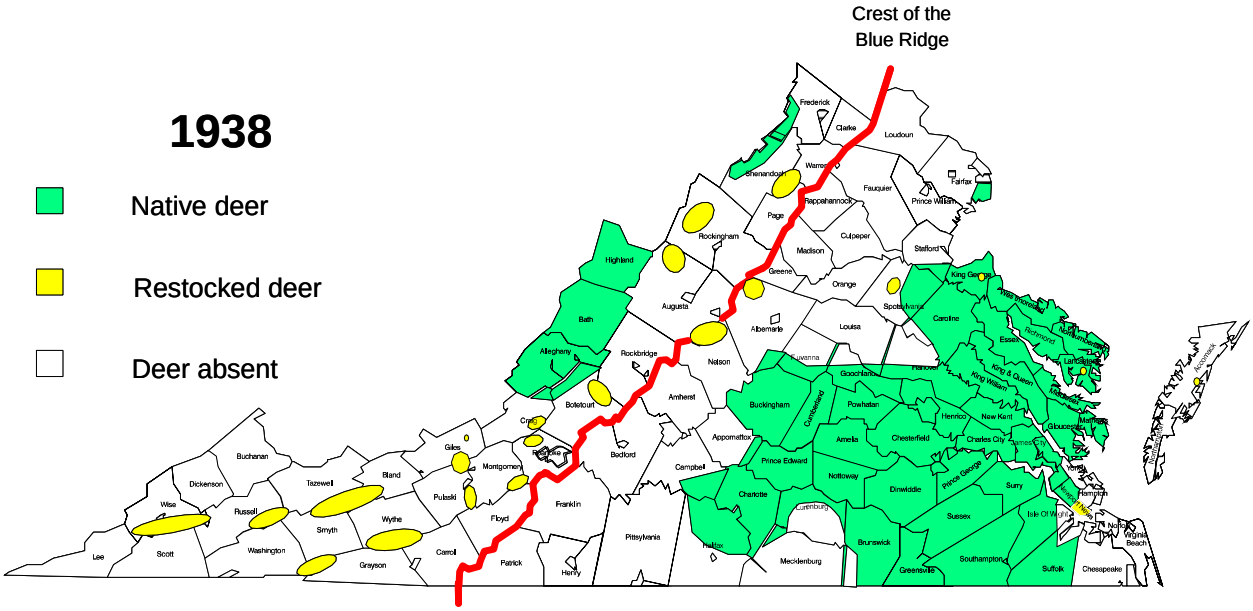


Figure 5. Virginia deer distribution in 1938 (estimated 50,000 deer).

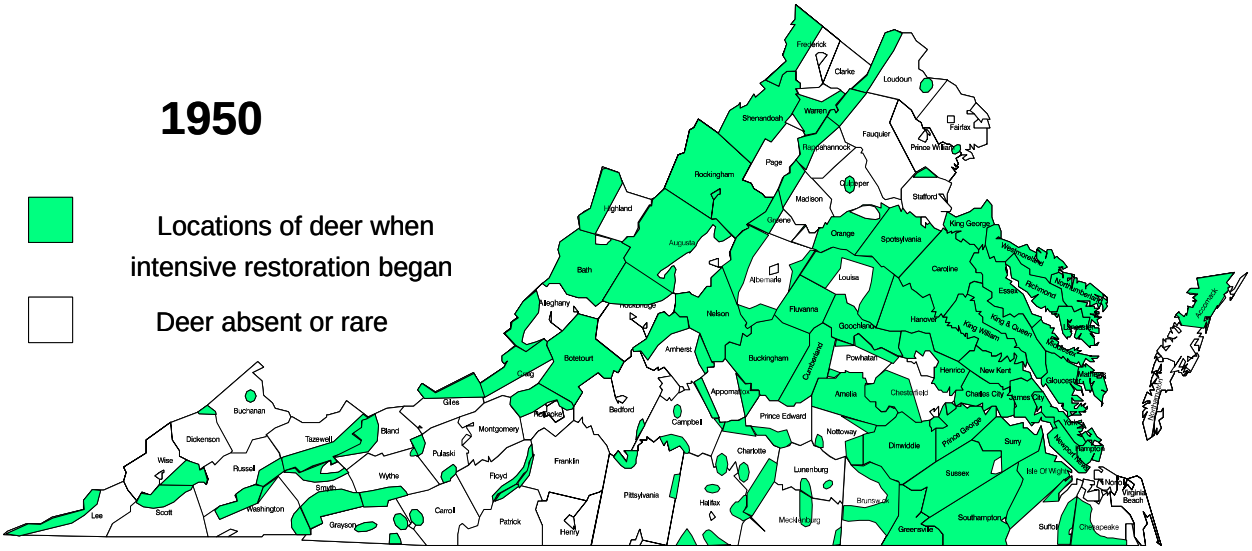


Figure 6. Virginia deer distribution in 1950 (estimated 150,000 deer).

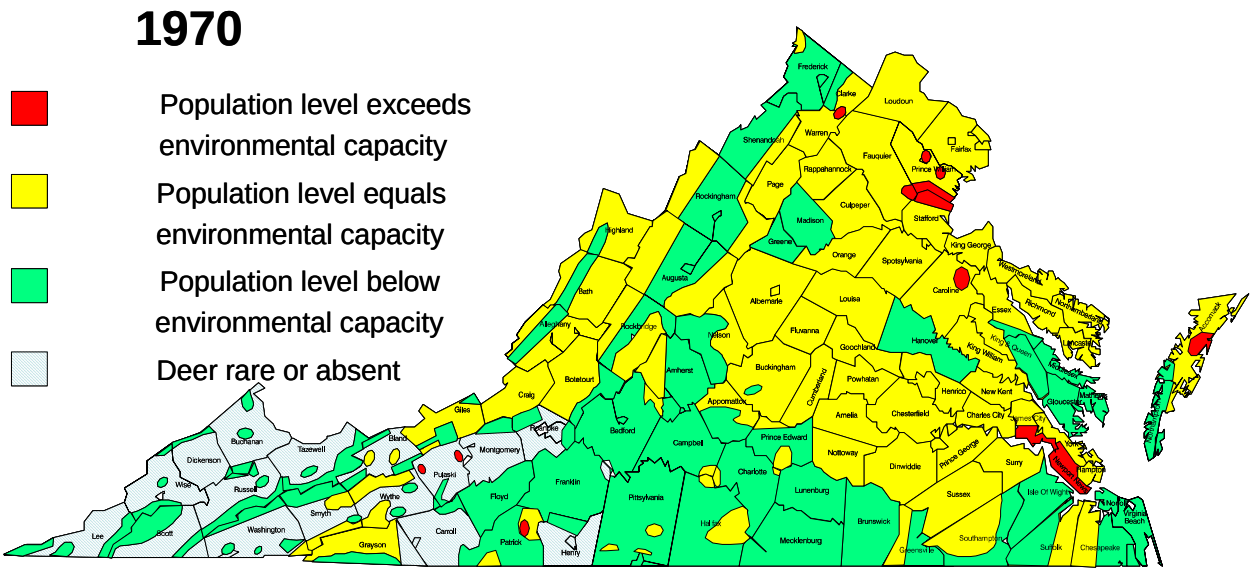


Figure 7. Virginia deer distribution and relative abundance in 1970 (est. 215,000 deer).

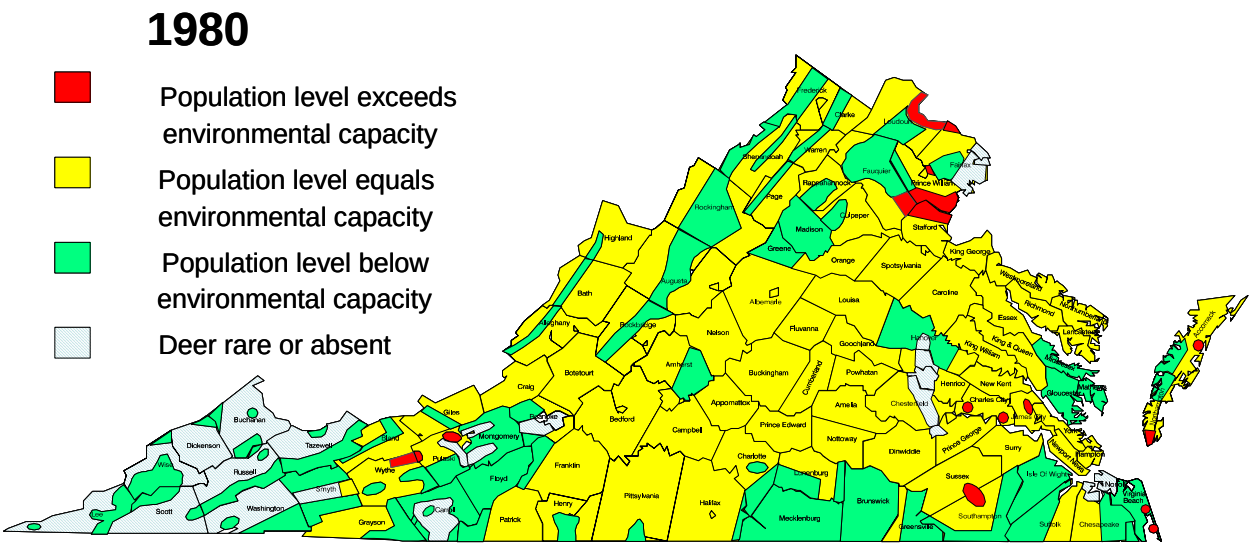


Figure 8. Virginia deer distribution and relative abundance in 1980 (est. 425,000 deer).

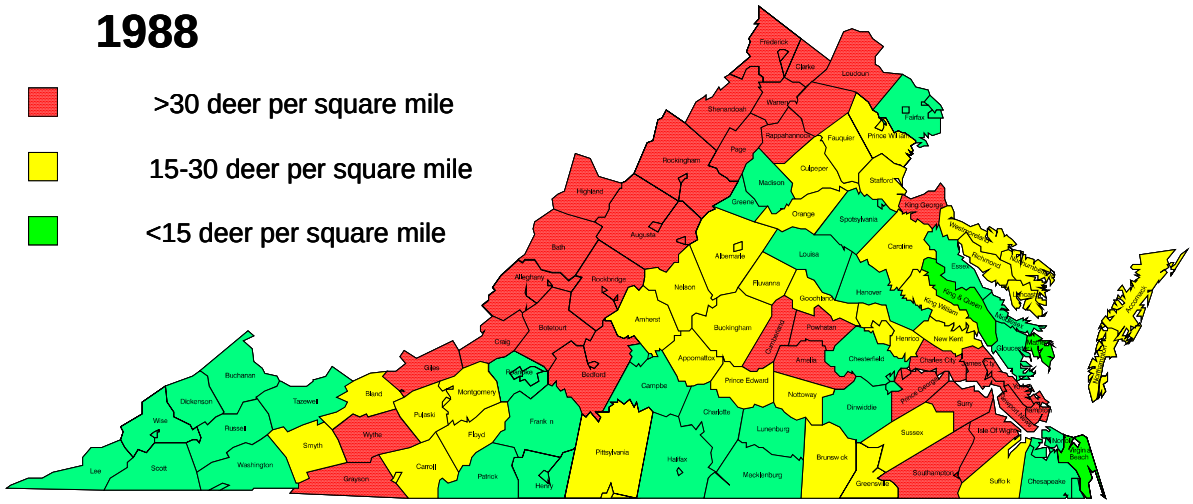
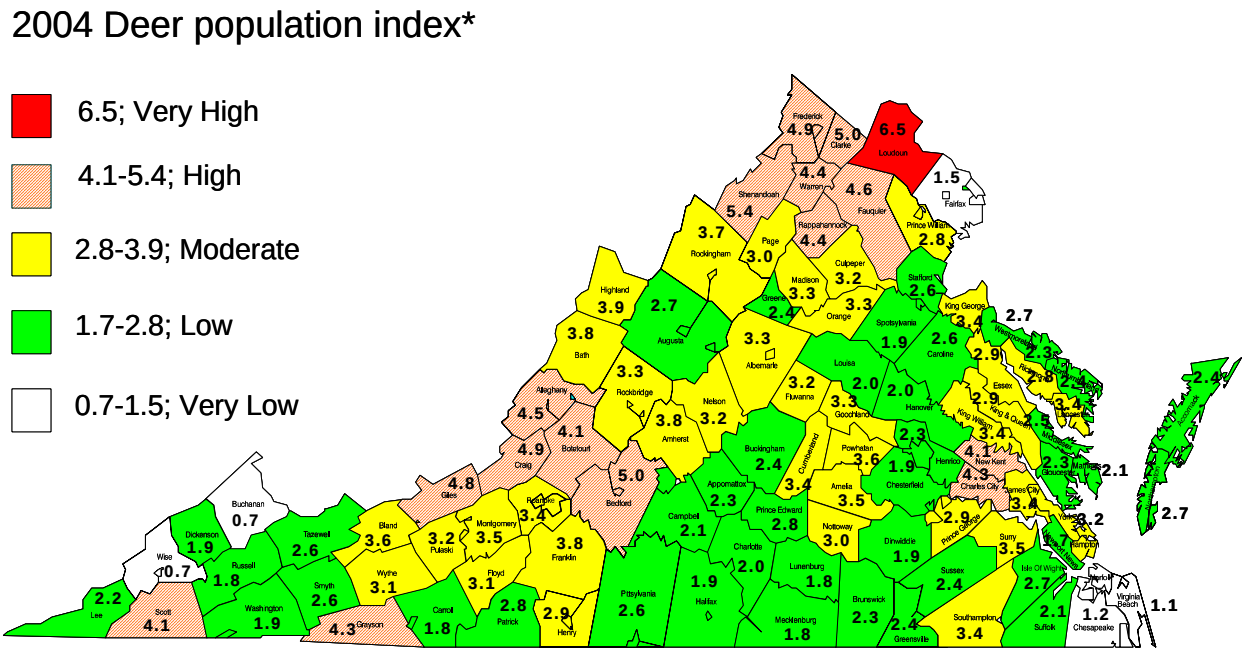


Figure 9. Virginia deer density estimates by county in 1988 (estimated 575,000 deer).



*Index = antlered buck kill / deer habitat in square miles (3 year average based on 2004 data); five categories determined by univariate cluster analysis

Figure 10. Relative deer population abundance by county on private lands in Virginia.

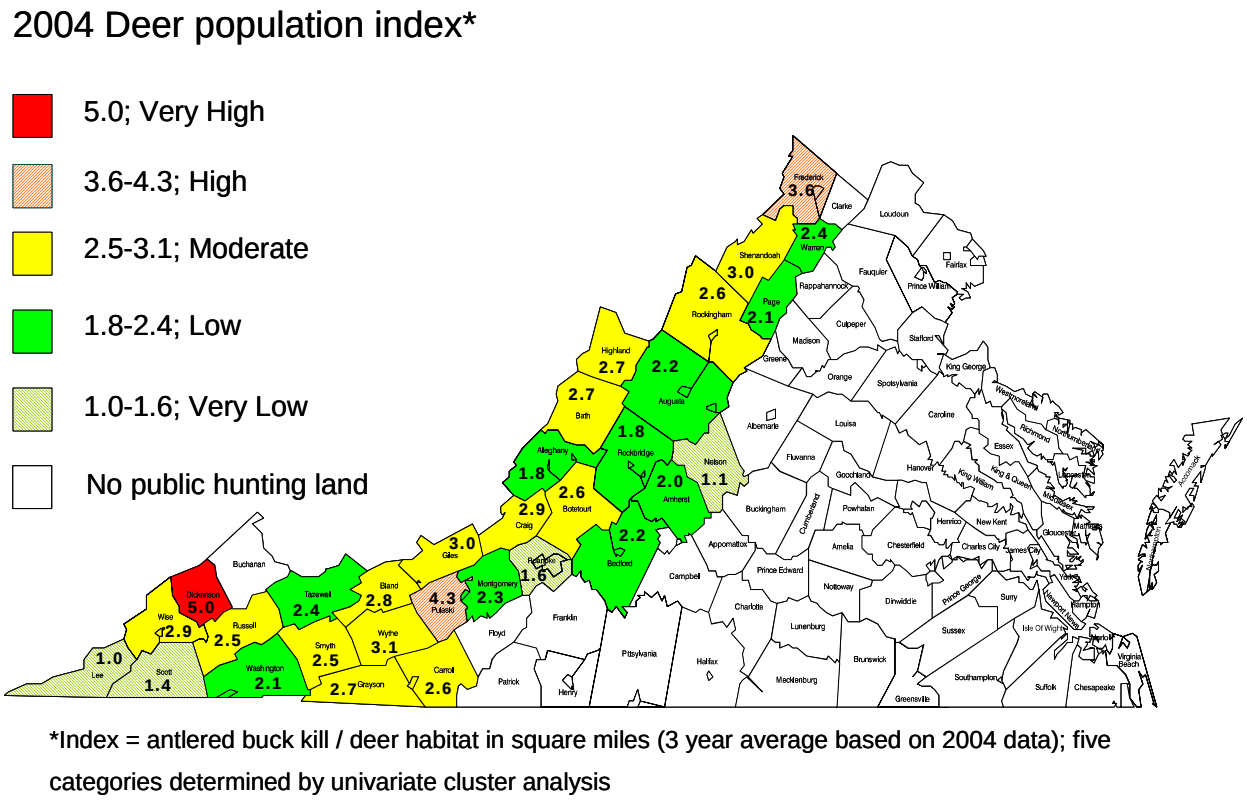


Figure 11. Relative deer population abundance by county on public lands in Virginia.

1970.----The 1970 SCWDS map depicted a significant increase in the distribution of deer (Figure 7). The northern and southern Piedmont, which lacked deer in 1950, were repopulated by 1970. Deer occupied virtually all-available range east of the Blue Ridge Mountains and in the northern Mountains by 1970.

In addition to significantly expanding its range, Virginia's deer population also continued to grow. By 1970, Virginia's statewide deer population was estimated to be approximately 215,000 animals. Beginning with the 1970 SCWDS map, relative indices of deer population abundance were provided for the first time and included the following: populations exceeding the environmental capacity, populations equal to the environmental capacity, populations below the environmental capacity, and areas where deer were rare or absent.

Environmental capacity, as described for Virginia in 1970 and 1980, represented optimum population levels where habitat is not limiting and physical condition and reproduction is relatively good. Environmental capacity would be much below *biological carrying capacity* - the maximum number of deer the habitat could support on a sustained basis. At biological carrying capacity, physical condition and reproduction will decline due to the lack of food and other resources.

Unpublished data from the same period indicate that areas below the environmental capacity typically had deer densities of less than five deer per square mile. Areas described as equal to the environmental capacity ranged from 5-25 deer per square mile, and areas exceeding environmental capacity exceeded 25 deer per square mile.

1980.----Significant increases in the abundance of deer in Virginia occurred between 1970 and 1980 (Figure 8). By 1980, a majority of the Tidewater, Piedmont, and northern Mountains were described as fully occupied at environmental capacity. Populations in the southern Mountains had expanded slightly but were still described as below environmental capacity, with many areas where deer were rare or absent. The 1980 statewide deer population was estimated at 422,000 animals.

1988.----In 1988, SCWDS updated its white-tailed deer distribution map for the entire United States. In contrast to the earlier maps, this map introduced specific density estimates on a county basis (Figure 9). Population estimates used for the 1988 map were based on the highest estimated 1986 or 1987 antlered buck harvest figure per square mile of forested area. Estimated antlered buck harvests by county were calculated from check station data using the equation: estimated antlered males = total male harvest - (total female harvest * 0.3). The deer densities for the 1988 map were assumed to be 10 times the estimated antlered buck kill per square mile of forest range. Based on this model, the 1987 statewide deer population was estimated to be approximately 575,000 animals.

2004.---For current management purposes, deer population status is monitored using an index of antlered buck kill per square mile of estimated deer habitat (Figures 10 and 11). Although this technique does not provide a total number of deer or absolute deer density (i.e., number of deer per square mile) within a management area, it does provide a reliable method to compare relative deer densities among management units and regions of the state and allows deer population trends to be monitored over time.

Current population reconstruction computer models indicate that Virginia's statewide deer population has been relatively stable over the past decade, fluctuating between 850,000 and 1,050,000 animals (mean = 945,000). Over much of the past decade, the highest private land deer population densities in Virginia have been found in far Northern Virginia. A group of high deer density counties also are found in the Allegheny Highlands and in several adjacent counties to the south and east of the Allegheny Highlands. Moderate deer densities characterize much of the Shenandoah Valley, the Central Piedmont, the far Southwestern Piedmont, the lower end of the Lower Peninsula, and the upper end of the Middle Peninsula. Three areas of the state could be characterized as having low deer densities. These include far Southeastern Virginia, South-Central Virginia, and far Southwestern Virginia. Lastly, the lowest deer densities in Virginia are found on the Cumberland Plateau.

Deer Management Program

Big Game Checking System.----The cornerstone of Virginia's deer management program is the big game check station system, which allows VDGIF to effectively monitor annual deer harvests on a county basis. In contrast to many states that estimate their annual deer harvest(s), Virginia's deer harvest figures represent an actual known minimum count. The check station system provides harvest figures that the public understands and has confidence in. Beginning in 1947, each successful deer hunter was required by law to check every harvested deer at a check station to receive an official game tag. Information regarding the animal's sex, date of kill, type of weapon, and county of kill was recorded.

Check stations are operated by local volunteers who serve without compensation. During the 2004 deer season, approximately 1,250 big game check stations were distributed throughout the Commonwealth. The check station system is administered as a joint effort between the Wildlife and Law Enforcement Divisions. Law Enforcement selects and supervises the check stations while the Wildlife Division provides equipment and materials and tabulates the annual harvest data. Results of the annual deer harvest are available about one month after the close of the season. Beginning in 2004, VDGIF initiated an automated telephone deer checking system (1-866-GOT-GAME) for hunter convenience. A successful hunter could check his or her animal at a check station or by calling it in on the new telephone checking system. Approximately 44% of the deer harvest was checked using the new telephone checking system during 2004; 51% of deer were checked by phone in 2005.

Deer Harvest Regulations.---- At the state level, deer harvest regulations are evaluated and amended every other year. Depending on management goals and the current status of the deer herd, regulation amendments may involve adjustments to season length(s), bag limit(s), and/or the number of general firearms season either-sex deer hunting day(s) on a county basis.

The process to change regulations typically stretches over one year and represents a major investment of VDGIF staff time and effort. The process to review and amend hunting, fishing, wildlife diversity, and boating regulations occurs biennially. Public and staff begin submitting issues during one year, and the Board of VDGIF holds a series of public meetings the following year. The public has an extended period to review

and comment on staff recommended regulations before the Board acts to propose and finalize amendments. New regulations typically will become effective on July 1 of the year following adoption.

Deer Management: Two Traditions.----Deer management in Virginia is characterized by 2 distinct zones of tradition and regulation, east of the Blue Ridge Mountains and west of the Blue Ridge Mountains. Deer hunting east of the Blue Ridge Mountains is rooted strongly in a private land hunting club tradition, where use of hounds and a 7-week general firearms season prevails. Conversely, west of the Blue Ridge Mountains, hunting deer with dogs is prohibited by state law, hunt clubs are less common, nearly 2 million acres of public lands are available for hunting, and the general firearms season is 12 days long in most counties. Prior to 1964, the western firearms season was 6 days long. Eight southwestern Piedmont counties (or portions thereof) east of the Blue Ridge Mountains have been incorporated over time into the "western" framework since the late 1950s and early 1960s. Historically, bag limits and either-sex deer hunting opportunities west of the Blue Ridge Mountains have been more conservative than those in eastern Virginia. East of the Blue Ridge Mountains, in the extreme southeastern corner of the state, 3 cities (Chesapeake, Suffolk [east of the Dismal Swamp line], Virginia Beach) have an October 1 through November 30 firearms deer season.

Deer Management Paradigm.----The density and health of Virginia's deer herd has been managed by controlling the number of antlerless (i.e., either-sex) deer hunting days. Virginia was one of the first southeastern states to recognize the need to harvest antlerless deer. The first either-sex deer days were held east of the Blue Ridge Mountains in all of Caroline and King and Queen Counties, and sections of Southampton and Sussex Counties, during the 1946-1947 season. West of the Blue Ridge Mountains, the first either-sex deer season was held in Augusta County in 1951. From 1951 to 1967, many different combinations of either-sex deer season approaches were tried. Heavy harvests of antlerless deer in some counties were followed by a marked reduction in the number of antlered deer harvested, suggesting that the level of antlerless deer harvest could control deer populations. Although the VDGIF Game Division adopted a sustained yield management strategy in 1967, management objectives were, and still are, accomplished by increasing or decreasing the number of either-sex deer hunting days.

Currently, deer management objectives aim to limit or stabilize populations over much of Virginia. This represents a change in direction regarding deer management, from an initial effort to establish and expand the deer herd to one of controlling population growth. Deer population management is based on the concept of *cultural carrying capacity* – the number of deer that can coexist compatibly with humans. Liberalized hunting regulations enacted over the past decade appear to have stabilized herd growth in most areas. Current population reconstruction computer models estimate a prehunt population of 900,000-1,000,000 deer in Virginia (Figure 1; C). Although frequently cited as overpopulated by the press, most of Virginia's deer herds are managed through regulated hunting at moderate to low population densities, in fair to good physical condition, and below the biological carrying capacity of the habitat.

Hunter cooperation in deer population management is critical. Regulations are developed to achieve population objectives, but hunters' choices ultimately determine the success or failure of regulatory strategies. In the future, additional opportunities or incentives may be necessary for hunters to harvest an adequate number of deer to meet population objectives in some areas. Currently, the existence of the Hunters for the Hungry Program encourages hunters to harvest deer they may not otherwise take and donate excess deer to food banks.

Deer Management Assistance Program (DMAP).----DMAP was implemented by the VDGIF in 1988. DMAP is a site-specific deer management program that increases a landowner's or hunt club's management options by allowing a more liberal harvest of antlerless deer than offered under general hunting regulations. The primary goal of DMAP is to allow landowners and hunt clubs to work together on a local level to manage their deer herds. Landowners/hunt clubs have the option to increase, decrease, or stabilize deer populations on their property enrolled in DMAP. These objectives are accomplished by harvest strategies that control the number of antlerless deer taken, primarily through the issuance of DMAP tags. DMAP tags can be used only to harvest antlerless deer (does and male fawns) and are not valid for antlered bucks. Secondary objectives are to increase VDGIF's biological database and to improve communication between deer hunters, landowners, and VDGIF. During the 2004-05 hunting season, 26,776 DMAP tags were issued to 803 cooperators on more than 1.4 million acres, resulting in the harvest of 22,389 deer.

Damage Control Assistance Program (DCAP).----Like DMAP, DCAP started in 1988 and also is a site-specific deer damage management program designed to increase a landowner's management options by allowing a more liberal harvest of antlerless deer than offered under general hunting regulations. The primary objective of DCAP is to provide site-specific assistance to control crop depredation or other property damage by deer. A landowner who demonstrates damage from deer can use a kill permit at the time of damage (see below) or may defer removing deer until the hunting season using DCAP tags. DCAP permit tags can be used only to harvest antlerless deer (does and male fawns). DCAP is not available in cities and counties east of the Blue Ridge in which the general firearms deer season is full season either-sex (except Fairfax County). Secondary objectives are to maximize hunter participation in the control effort and to shift closed-season kill permit deer harvest(s) into the open deer season. During the 2004-05 hunting season, 11,067 DCAP tags were issued to 1,074 cooperators on 285,534 acres, resulting in the harvest of 3,246 deer.

Kill Permits.----As provided by Virginia State Statute §29.1-529. *Killing of deer or bear damaging fruit trees, crops, livestock or personal property or creating a hazard to aircraft*, the VDGIF is authorized to permit owners or lessees of land to kill deer where deer cause commercial or personal property damage. Under the kill permit system, a landowner/lessee who sustains deer damage must report the damage to the local game warden for investigation. If, upon investigation, the game warden (or designee of the Director) determines that deer are responsible for the reported damage, he/she may authorize in writing that the owner/lessee, or other person(s) designated by the game warden, be allowed to kill deer when they are found upon the property where the damage occurred. In calendar year 2004, 1,892 kill permits were issued for deer and 6,587 deer were reported killed.

Deer Population Reduction Program (DPOP).----DPOP is a site-specific urban deer management tool that allows managers of public or private properties with unique deer management needs (e.g., parks, airports) to use sharpshooters and/or recreational deer hunters to kill extra antlerless deer outside of traditional established seasons. During 2004-2005, 14 DPOP permits were issued in Virginia.

Urban archery season.----An urban archery season was initiated in 2002 to help reduce deer-human conflicts in urban areas while providing additional hunting recreation. Only antlerless deer may be taken during this season. This special season provides hunters with 2 additional weeks before the statewide archery season begins in October and 3 additional months after general firearms season ends in January. Several urban counties and all but a few cities and towns are eligible to participate in this urban archery program. In order to participate, a locality must submit its intent to VDGIF and advise VDGIF of any applicable weapons ordinances or other restrictions. The season offers maximum flexibility to localities. No special hunting licenses or permits are required beyond archery and big game licenses. Eleven localities participated during 2002-03, 13 during 2003-04, 17 during 2004-05, and 18 during 2005-06.

Deer Disease Surveillance.----For decades, VDGIF has monitored important deer diseases (e.g., hemorrhagic disease). However, since chronic wasting disease (CWD) has become a national disease issue, Virginia and other eastern states have adopted test procedures and regulations to detect and/or halt the spread of this contagious disease. To establish whether CWD occurred in Virginia, VDGIF initiated a surveillance program in fall 2002. The CWD surveillance program tests deer using 3 different approaches: (a) random sampling of hunter-killed deer, (b) target or suspect animal surveillance, and (c) testing of all captive deer mortalities. Surveillance efforts have been designed to detect CWD in the state's free-ranging deer population, even if the incidence is very low (less than 0.5%). Deer have been sampled from every county in the Commonwealth. During the period 2002-2005, samples from approximately 1,900 deer in Virginia all tested negative for CWD.

During 2005, VDGIF revised CWD surveillance and response plans to address risk factors in neighboring states as well as in the Commonwealth. In September 2005, chronic wasting disease was discovered in a free-ranging white-tailed deer in Hampshire County, WV less than 10 miles from Frederick County, VA. Nearly 600 hunter-killed and road-killed deer were sampled in a high risk active surveillance area encompassing portions of Clarke, Frederick, Loudoun, and Shenandoah County during 2005. CWD was not detected in any of these samples.

Captive Deer.----Deer held in zoos or other captive settings are regulated by VDGIF to provide for lawful research, education, and other purposes while minimizing disease risks to wild white-tailed deer. Since November 2002, a DGIF permit has been required to possess any member of the deer family (*Cervidae*) in

Virginia (§4 VAC 15-30-40). Private citizens in Virginia are not allowed to keep deer as pets or as part of a private menagerie. As of May 2006, 22 permitted facilities—primarily those that exhibit deer to the public—held approximately 500 deer in captivity in Virginia. VDGIF also changed permit conditions in 2002 to prohibit the importation or movement of any deer species into or within Virginia as a means to prevent important deer diseases from being introduced. New standards also required permittees to individually mark all captive deer, keep records, and report deaths and escapes immediately. CWD testing of all captive adult deer mortalities is mandatory.

Deer hunting enclosures.----In 2001, the Virginia Assembly passed §29.1-525.1 to prohibit (a) the erection of a fence with intent to confine deer, and (b) hunting within a fenced area that prevents or impedes the free egress of deer. Exceptions were made for areas that are fenced to ensure human safety (e.g., military installations), permitted captive deer facilities, and 5 existing deer enclosure operations that were in existence or under construction in Virginia at the time the law was passed. These 5 enclosures were required to register with VDGIF, modify their fences, and operate under management practices approved by VDGIF. Concerns about private ownership of wildlife, fair chase hunting, disease transmission, and habitat degradation led to passage of this statute. Currently there are 4 registered deer hunting enclosures in Virginia.

Elk.---- During the past several years, an ambitious elk restoration program has been undertaken in southeastern Kentucky and has created a population currently estimated at more than 5,000 animals. The Kentucky elk restoration area directly adjoins the borders of Buchanan, Dickenson, Wise, and Lee Counties of Virginia. Since initial establishment of that elk population, numerous elk have dispersed into Virginia. The DGIF has been concerned about accidental introduction of CWD or other diseases of deer from western states where these elk originated. Because there is no valid live animal test for CWD, there is no way to guarantee that elk moved from western states into the mid-Atlantic region are CWD-free. Capturing and returning elk that disperse into Virginia back to Kentucky has not proven to be a practical management option. Therefore, to prevent elk from becoming established in Virginia, the DGIF allows elk of either sex to be harvested throughout all regulated deer seasons. The total harvests of elk, as reported through check station records for recent deer hunting seasons, were as follows: 2000-1, 2001-4, 2002-10, 2003-8, 2004-2, and 2005-1.

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DEER PROGRAM SUPPLY AND DEMAND

Introduction

The change in direction for deer management in Virginia from one of establishing and expanding the deer herd to one that seeks to manage population growth has been driven primarily by cultural carrying capacity (CCC). CCC is defined as the number of deer in a defined area that can coexist compatibly with humans. CCC therefore is a function of humans' tolerance of deer and their effects. CCC can vary widely between and within communities. Deer management objectives developed under a CCC model tend to be somewhat subjective and will be influenced by the attitudes and values maintained by residents of each area on specific social, economic, political, and biological issues. The CCC for deer typically will fall well below the biological carrying capacity (BCC) - the maximum number of deer that a habitat can sustain over time

Under optimum conditions, deer populations have the potential to double in size annually. Lacking an externally imposed regulating factor (e.g., predators, hunting), deer populations can expand to a point where they will surpass the ability of the habitat to provide sufficient food resources. Thus, in unmanaged populations, a deteriorating food supply eventually will begin to limit deer numbers. This is a central premise of the concept of BCC. Thus, BCC clearly is a function of both the quality and quantity of that original habitat. The BCC is not a fixed number and it will change both seasonally and annually. Here in Virginia, limits imposed by food shortages and the harsher climate during winter typically define what the base BCC limit will be. Deer herds that expand up to BCC are frequently, but inaccurately, called overpopulated.

Virginia currently does not have many widespread "overpopulated" deer herds. Although Virginia's deer herds are often portrayed as being overpopulated, most can best be characterized as being at low to moderate population densities, below the BCC, with animals in good physical condition. The harvest of antlerless deer by recreational sport hunters currently is the most effective and cost-efficient method to manage deer populations.

Supply

Deer Habitat

Like other animals, white-tailed deer have specific habitat requirements that must be fulfilled, which include food, water, cover, and space. Of these, food is the most critical in Virginia because the average adult white-tailed deer requires 4-6 pounds of food daily per 100 pounds of body weight.

Habitat quality for deer is correlated significantly with soil type and characteristics, especially soil fertility, which directly affects the type and quality of vegetation that comprises deer habitat. In addition to soil quality, habitat type, successional stage, and the amount of habitat interspersion or edge each can affect deer habitat quality. In general, habitat management practices that improve soil fertility, increase the number of habitat types, revert mature habitats to earlier successional stages, or increase the interspersion of habitat types will increase carrying capacity for deer.

Typically, there is a direct inverse relationship between deer density and the physical condition of animals within a herd. As deer population density increases, overall herd condition and reproductive rates decline. Conversely, as deer population density decreases, herd health improves and reproductive rates rise.

Deer Habitat Types----Virginia's 39,675 square miles of land area has been divided into 5 major physiographic regions — the northern and southern Mountains, the northern and southern Piedmont, and the Coastal Plain (Figure 12). The northern Mountains and southern Mountains are further subdivided into 3 categories — the Appalachian Plateau, Ridge and Valley, and Blue Ridge. Habitat types and forest communities differ among these regions. Examples of mountain forest habitats include mixed mesophytic, northern hardwoods, Appalachian oak, and oak/hickory/pine. Soils of the narrow ridges and steep slopes typical of the Appalachian Plateau and Ridge and Valley provinces typically are shallow and low in fertility whereas soils found in the valleys are derived from shale and limestone and are relatively fertile. Soils of the Blue Ridge formed primarily from metamorphic and igneous rocks and, as a result, tend to be deeper and have

better fertility than Ridge and Valley and Appalachian Plateau soils. Habitats in the Piedmont are characterized by Cecil sandy loam soils with a red clay subsoil. These soils generally are acidic, low in organic matter, phosphorus, and nitrogen, and commonly support mature oak/hickory forests. In the Coastal Plain, habitats are diverse (they grade from coastal marshes to pine-pine/oak-pine/hardwood forests to bottomland hardwoods) and soils typically are low in fertility. The most productive forest type for deer in the Coastal Plain is bottomland hardwoods.

Deer Habitat Status----In Virginia, 99 deer management units have been established (all counties plus cities of Chesapeake, Newport News/Hampton, Suffolk, and Virginia Beach) that range from 26 to 971 square miles in size (average = 399 square miles, Figure 10). For management purposes, the amount of available deer habitat (defined as the sum of forested, open/agriculture, and wetland land area) is estimated within each management area. This also equals the total land area of the management unit minus all developed and barren areas. Data used to classify and tabulate land cover or habitat types in this plan came from U.S. Geological Survey's National Land Cover Dataset (NLCD), which uses 1992 satellite imagery. At the time of the printing of this plan, 2000/2001 NLCD data is available for only the Coastal Plain of Virginia, but coverage for the rest of the state is expected by 2007. Deer habitat data will be updated when the new dataset becomes available statewide.

According to this data, the 39,675 square miles of land in Virginia can be broken down as follows: 1,393 square miles (4%) developed, 586 square miles (1.5%) barren, 26,245 square miles (66%) forested, 9,710 square miles (24%) open and/or agriculture, and 1,582 square miles (4%) wetlands (Appendix 2). The state's most developed management units are located in the cities of Hampton (46%) and Newport News (42%) and in Fairfax County (34%), whereas the most heavily forested units are located in Buchanan (96%) and Dickenson Counties (94%). Clarke (58%) and Loudoun (54%) Counties possessed the most open and/or agricultural land. Using the protocol to determine what constitutes deer habitat, approximately 94% (37,232 square miles) of the total state land area currently is estimated to be available deer habitat.

This habitat database also provides estimates of the amount of public versus private land area present in each management unit. Ninety-two percent (92%) of the deer habitat in Virginia exists on private land, whereas 8% is found on public land. Most public lands in Virginia are located along and west of the Blue Ridge. Three management units in western Virginia have more than half of the available deer habitat located on public land: Alleghany County (59%), Bath County (56%), and Craig County (55%).

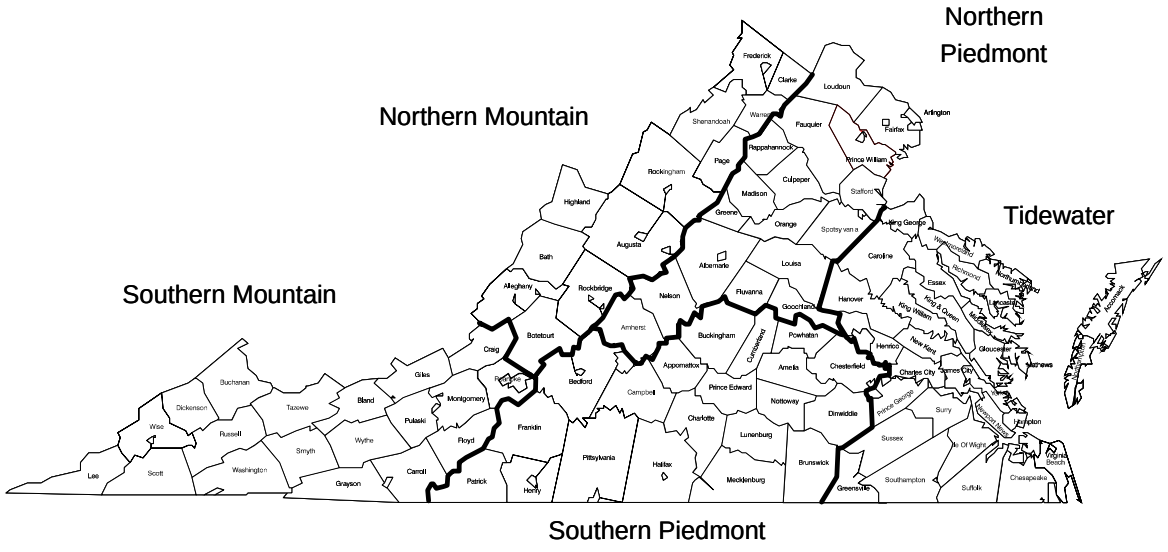

Figure 12. Virginia physiographic regions.

The 1.7 million acres of George Washington and Jefferson National Forests compose the largest public land ownership in Virginia and are particularly important as deer habitat and for deer-related recreation west of the Blue Ridge. In addition, VDGIF maintains 34 Wildlife Management Areas (WMAs) totaling 195,000 acres across the Commonwealth; 8 WMAs totaling 108,000 acres are located west of the Blue Ridge. The Virginia Department of Forestry administers 17 State Forests – 5 west of the Blue Ridge - and other lands totaling 48,000 acres. The 4 State Forests open to hunting are all located east of the Blue Ridge. With variable emphasis on habitat management, 17 State Parks and Natural Areas (5 west of the Blue Ridge), 8 National Wildlife Refuges (all east of the Blue Ridge), and 4 federal military areas (all east of the Blue Ridge) in Virginia offer some hunting opportunities.

An important deer management issue in western Virginia has been the decline in deer habitat quality on National Forests. Poor soils predominate and deer habitat has never been exceptional on most National Forest lands. Consequently, deer population densities historically have been lower in mountain habitats than in valley and bottomland habitats. However, deer habitat conditions on National Forests have worsened over the last several decades for several primary reasons: fire suppression, forest succession (maturation), and reduced timber harvests.

From before European settlement in the 1700s through the 1930s when aggressive fire suppression began, fires were much more frequent and extensive across Virginia. Fire stimulates the production of succulent browse, grasses, and forbs over the short-term and may open up stands to promote oak regeneration over the long-term.

Maturing forests have become less productive for deer and other wildlife species that need early successional habitats characterized by the growth of grasses, forbs, young woody browse, and other succulent vegetation at ground level. A number of declining or rare birds depend on early-successional habitat created by natural and human disturbances to mature forests. High quality deer habitat, characterized by the presence of early successional stages and an interspersion of differing habitat types, has declined on many National Forest lands. The amount of forested habitat classified as being within the 0-10-year age class on the George Washington and Jefferson National Forests has declined from >70,000 acres (4.1% of total area) in 1989 to 15,000 acres (0.9%) by 2004.

The amount of timber harvesting - which provides deer with ground level forage and cover - has been reduced over the past 20 years due to public opposition and federal budget restrictions (Figure 13). Approximately 0.1% of the total land area on National Forests in Virginia is harvested annually.

The use of prescribed fire has increased on National Forest lands (Figure 13). The success of prescribed fire in improving deer habitat depends on many factors, including site quality, stand conditions and fire prescriptions. Prescribed fire that results in canopy thinning will allow sunlight to reach the forest floor and sustain suitable ground level vegetation. These burns will be more beneficial to deer than burns resulting in no canopy thinning and ground level vegetation that persists for only one or two years.

Deer habitat quality is also relatively poor on forested portions of many of the state WMAs, particularly in the mountains. Budget constraints have led to reduced harvests in recent years, but future projections are expected to be on par with the harvest levels seen in the past. Statewide on all WMAs, total acres harvested per year averaged 470 during the 1980s, 790 during the 1990s, and 390 during 2000-2005. Approximately 0.2% of the total land area on WMAs is harvested annually. Prescribed burning, maintenance of forest clearings, and wildlife plantings on WMAs also benefit deer.

Even without active management of forests, natural disturbances such as wind, ice storms, disease, pests, fire, etc. will produce dispersed canopy gaps where some minimal level of deer forage will be produced. However, the biological carrying capacity for deer will remain below the level that could be achieved with active forest management. Further, without management to improve deer forage on National Forests and State WMAs, it is unlikely that deer populations can be sustained at levels to meet public demands for viewing and hunting without significant deer damage to plant communities. Management activities that produce forage for deer can also reduce deer browse pressure on sensitive plant species and regenerating forest trees.

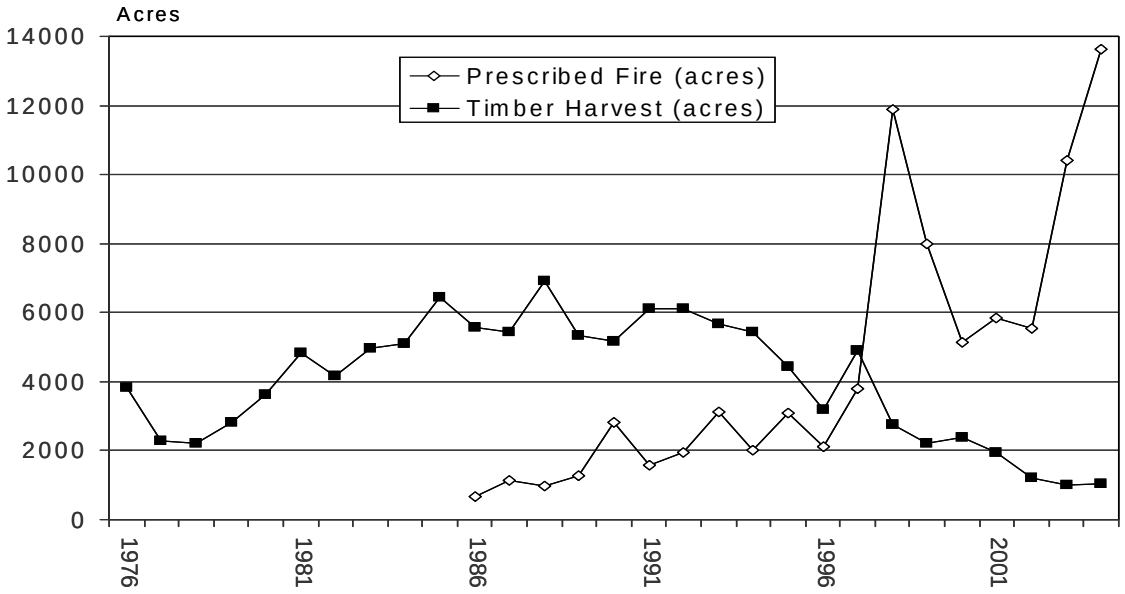

Figure 13. George Washington and Jefferson National Forests timber harvest and prescribed fire acreage, 1976-2004. (1976-1987 timber acres are estimates).

Deer Populations

Current population reconstruction computer models indicate that Virginia's statewide deer population has been relatively stable over the past decade, fluctuating between 850,000 and 1,050,000 animals (mean = 945,000). The status of the deer population is assessed by monitoring the annual harvest of antlered bucks per square mile of estimated deer habitat (Figures 10 and 11). Data on the number of antlered bucks killed are obtained from VDGIF's big game check stations and the telephone checking system. These data are conservative because it is a minimum count, and thus represents an index to the total population.

The statistic on annual harvest of antlered bucks per unit area routinely is used as an index of the deer population and, when viewed over time, allows the agency to monitor changes in the population. The index is based on the assumption that, in most habitats, deer populations exhibit density-dependent population responses (i.e., deer condition and reproductive rates inversely correlate with deer density). While the antlered buck index is generally assumed to track changes in population size, interpretation of the index can also be influenced by other factors such as habitat quality, hunting regulations, hunting pressure, hunter selectivity, and population density. When this population-habitat relationship is plotted, a distinctive parabola shaped recruitment curve is generated, where maximum sustained yield (MSY) occurs at a population density of approximately 60% of biological carrying capacity (BCC). Maximum sustained yield for antlered bucks occurs at higher densities (70-80% of BCC) in populations where hunting effort is focused predominately on bucks. In fact, a bucks-only hunting strategy generally will produce a population at >90% of BCC. Deer populations at BCC are, by definition, unhunted.

Trend analyses indicate that deer populations on private lands increased significantly in 30 management units and declined significantly in only 2 units during 1994-2003 (see Table 6 and Figure 21 in the next chapter). All counties without arrows are assumed to have had stable deer populations during this time. Deer populations on public lands increased significantly in only 1 management unit and declined in 2 units during 1994-2003 (see Table 7 and Figure 22 in the next chapter). Note that Besides Chesapeake, Newport News/Hampton, Suffolk, and Virginia Beach, cities and towns are not considered deer management units. Cities and towns are local deer management areas where deer population objectives may differ from the surrounding deer management unit(s).

Demand

Deer Hunter Demands

The white-tailed deer is the most popular game species in the Commonwealth of Virginia. Traditionally, the number of deer hunters and days spent afield hunting have provided useful measures of demand for deer program managers to work with. Data on these indices are obtained through analyses of license sales and periodic hunter surveys.

The 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation reported that hunting-related expenditures in Virginia (by both resident and nonresident hunters) totaled nearly $321 million for all game. Nearly 90% of those who purchase licenses in Virginia hunt deer and over 50% of hunting days afield are spent in pursuit of deer.

Number of Deer Hunters----According to the most recent license data (2004-05) there are approximately 240,000 deer hunters in Virginia. Using reported sales of big game licenses as an index, the number of deer hunters has declined over the past decade (Figure 14). The correlation between big game license sales and the number of deer hunters is not exact because big game licenses also include bear and turkey hunters. However, because hunter surveys indicate that nearly 90% of all big game licensees hunt deer, use of big game license sales provides a useful indicator of deer hunting trends. Although the overall number of deer hunters has declined, hunter participation in muzzleloading has increased significantly (Figure 15). Initiation of an early muzzleloading season in 1990 spurred an increase in participation by muzzleloader hunters (increased >200% between 1990 and 2004).

Hunting deer with dogs is a long-standing tradition in eastern Virginia and much of the southeastern United States. The 2004-05 hunter survey revealed that 44% of deer hunters used dogs and 56% did not use dogs in regions of Virginia where deer hunting both with and without dogs is permitted. Statewide, 30% of deer hunters used dogs during 2004. The only region of the state where a majority of deer hunters used dogs was the Tidewater (73%).

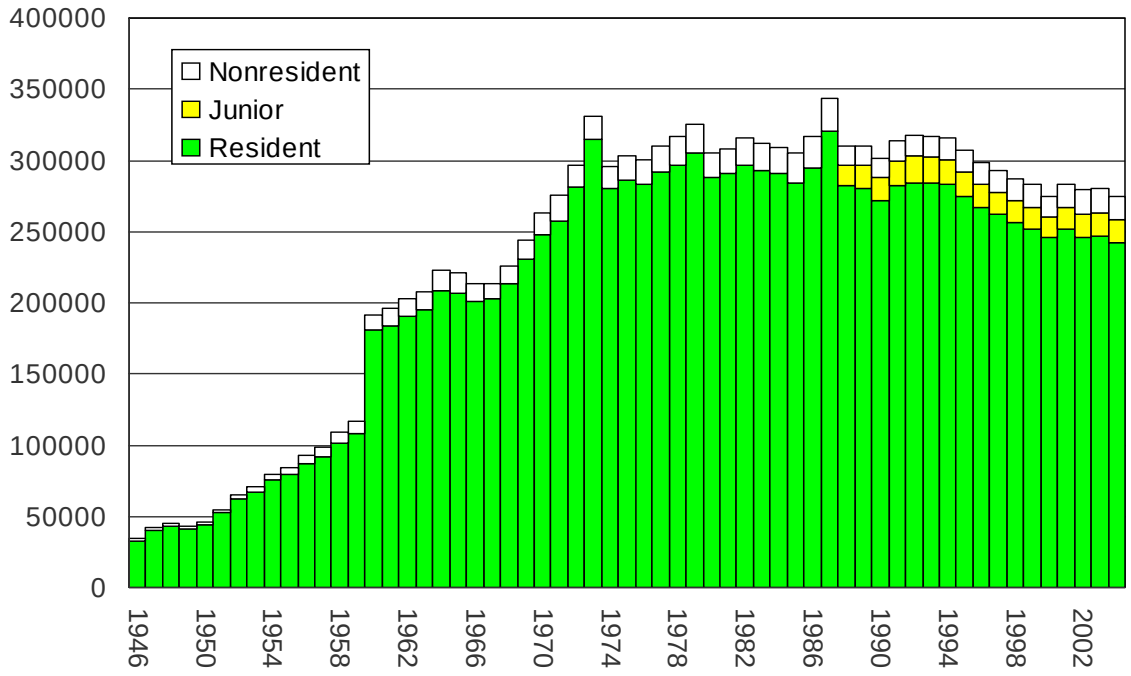

Figure 14. Virginia big game license sales, 1946-2004

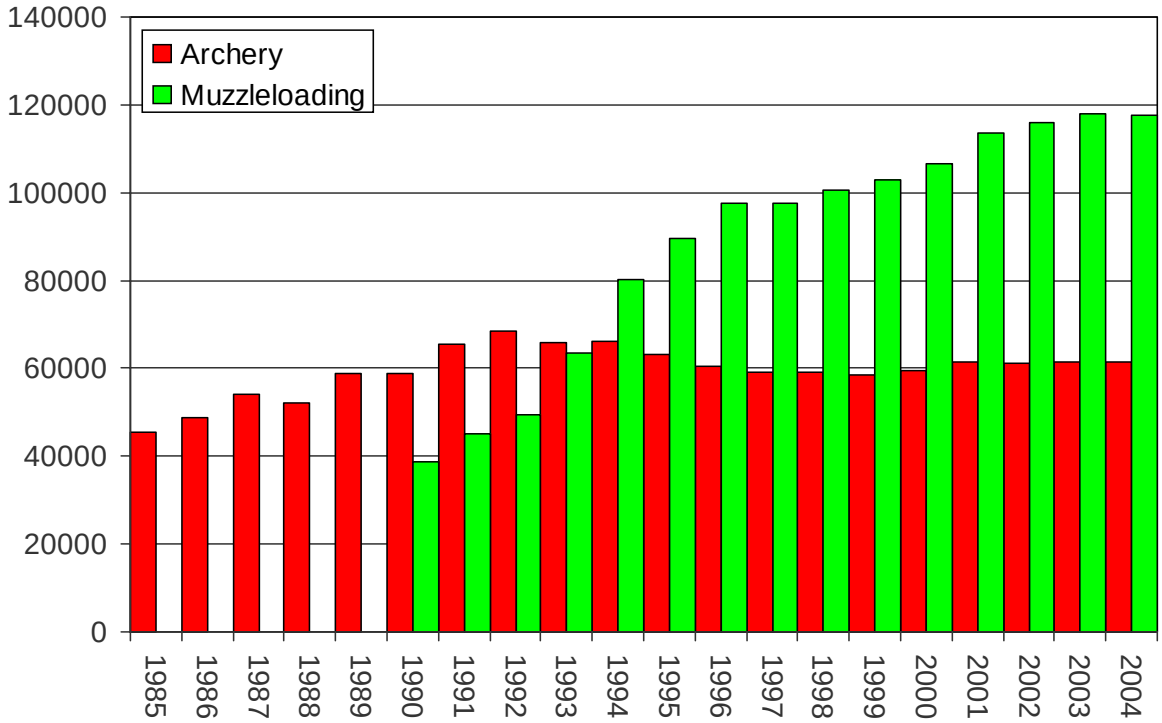

Figure 15. Virginia archery and muzzleloading license sales, 1985-2004

As a component of the general statewide population, total hunter numbers and their relative representation in Virginia's demographic profile also are decreasing (Table 1). Over the past decade, the number of Virginia residents who purchase a basic state hunting license has declined 17%. As a percentage of the total population, licensed hunters have declined 26% over the last 10 years. In 2004, resident licensed hunters comprised 3.4% of Virginia's population. A telephone survey conducted during February-March 2005 by Responsive Management, Inc. of Harrisonburg, VA found that 14% of Virginians had hunted within the past year and 13% of respondents considered themselves hunters. Some residents are not required to purchase a hunting license each year (e.g., landowners, youths under 12, lifetime-licensed hunters).

Table 1. Virginia human population and resident licensed hunter numbers, 1995-2004.

Year	Virginia Population	Resident Hunters	(%)
1995	6,618,358	301,538	4.6
1996	6,666,200	290,294	4.4
1997	6,737,500	283,229	4.2
1998	6,789,200	274,813	4.0
1999	6,872,900	268,678	3.9
2000	7,079,030	258,024	3.6
2001	7,196,800	264,773	3.7
2002	7,287,800	258,318	3.5
2003	7,364,600	255,913	3.5
2004	7,458,900	250,591	3.4

Deer Hunter Effort----According to the 2004-05 hunter survey, Virginia deer hunters spent approximately 2.5 million days afield in pursuit of deer. This total includes nearly 1.4 million general firearms hunting days, nearly 395,000 archery hunting days, and over 681,000 muzzleloader hunting days. Surveys indicate a significant decrease in deer hunter days afield between 1993 and 2005 (Figure 16).

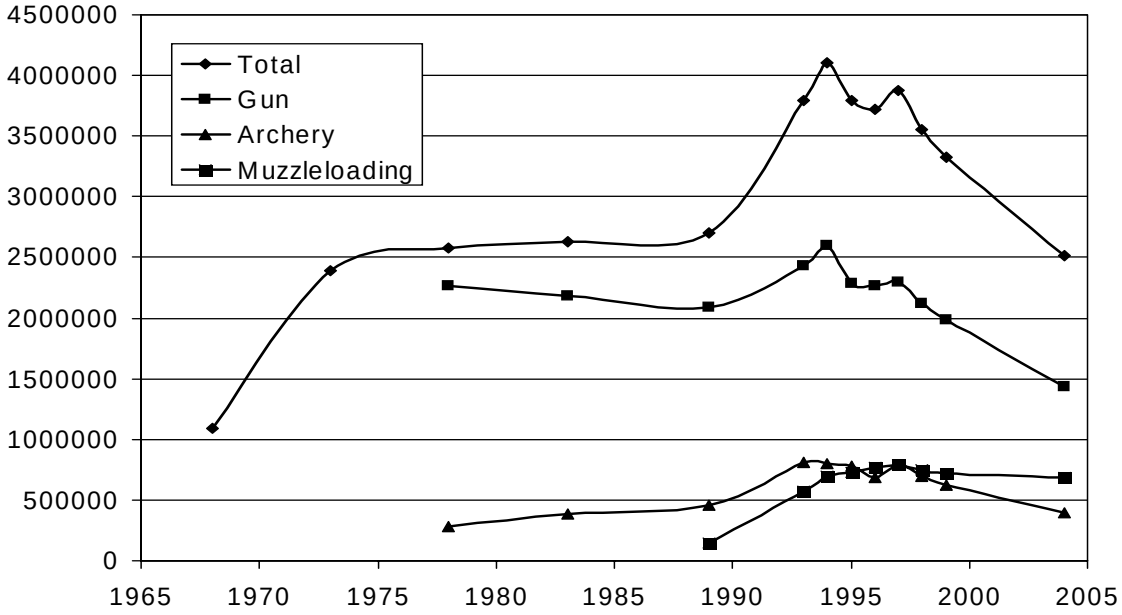

Figure 16. Virginia deer hunter days afield, from hunter surveys,1968-2004

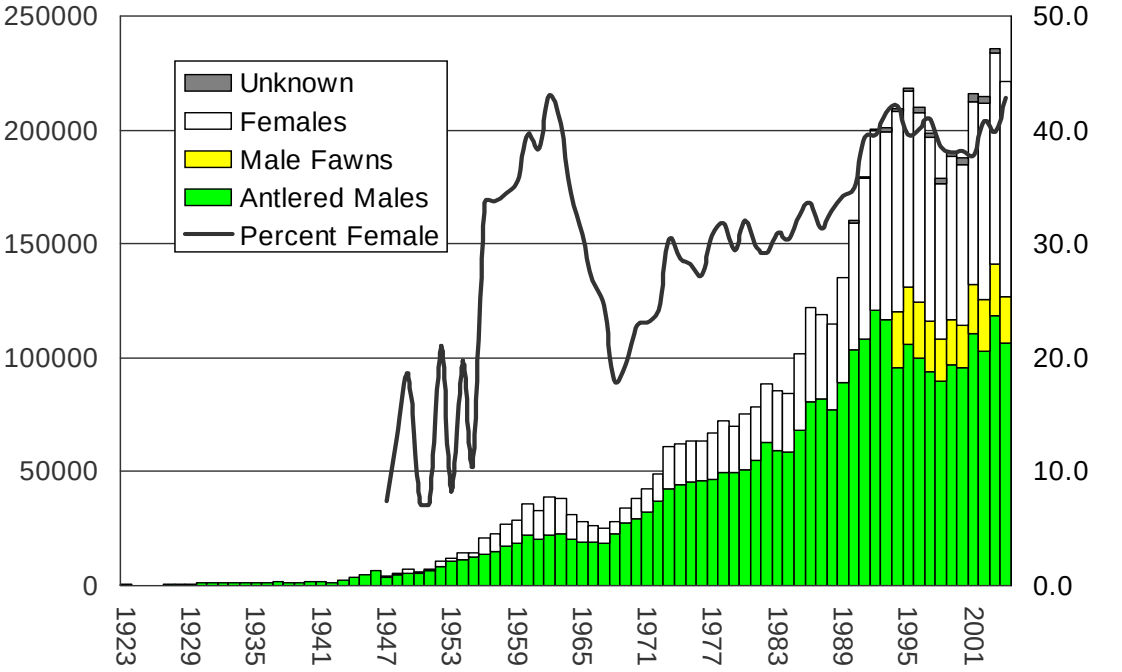

Figure 17. Virginia deer harvest, 1923-2004

Deer Harvest----It often is assumed that hunter expectation focuses only on the harvest and achieving hunting success. Official records of Virginia's statewide deer harvest have been maintained since 1923. Data on the deer kill since 1947 are based on known minimum figures derived from the mandatory big game checking system, whereas data generated prior to 1947 were estimates provided by local game wardens. Virginia's annual deer harvest has increased steadily, from an estimated 793 deer in 1923 to >200,000 deer in recent years, except for 2 periods during the mid-1960s and mid-1990s (Figure 17). During the 2005-06 deer season, 214,675 deer were reportedly harvested in Virginia.

Deer Hunter Success----Successful hunters are defined as those who harvest at least 1 deer per year. Like hunter effort, hunter success is another important management metric that is monitored through use of hunter surveys, which indicate that statewide hunter success increased slightly from 54.2% in 1993 to 59.8% in 2004 (Table 2). Some of this increase can be attributed directly to increases in success associated with use of modern muzzleloaders, which nearly tripled between 1989 and 1996. Higher success rates also are linked to the adoption of liberal either-sex opportunities and reflect the increased harvest of antlerless deer.

Table 2. Virginia deer hunter success rate (%) for the period 1993 to 2004.

Method	1993	1994	1995	1996	1997	1998	1999	2004
Archery	26.9	29.9	28.2	26.5	31.3	28.2	27.4	30.2
Muzzleloader	32.8	36.6	37.7	41.2	40.0	36.8	38.8	38.9
Gun	48.4	50.3	49.5	50.6	50.9	48.2	46.1	51.1
Statewide Average	54.2	57.1	56.0	58.9	60.2	57.4	56.7	59.8

Deer Hunter Satisfactions----Traditional measures of the results or benefits of wildlife management, such as the amount of game bagged and days spent afield, have been criticized. Some users of traditional indices of harvest and effort assume that, by maximizing harvest or the number of days spent afield, hunters will derive a corresponding and direct increase in benefit. Critics argue that the most significant product of sound wildlife management should be an increase in the quality of the hunting experience, a perspective that redefines how one determines whether expectations or demands have been met and introduces the concept of multiple satisfactions to game management. Numerous studies of hunter motivation and satisfaction demonstrate that many variables are important in hunter satisfaction.

To measure satisfaction among Virginia deer hunters, a hunter satisfaction index (HSI) (rated on a 7-point Likert scale; 1: poor, 4: adequate, 7: excellent) was introduced in the 1993-94 hunter survey. For example, when participants in the 2004-05 deer season were asked, "*Overall, how do you rate the quality of your deer (gun) hunting?,*" most expressed "adequate" satisfaction (mean response: 4.30) (Table 3).

Table 3. Hunter satisfaction (as expressed through HSI index) among Virginia deer hunters who use a gun, by region and statewide, for the period 1993 through 2004.

Physiographic Region	1994	1995	1996	1997	1998	1999	2001	2004
Tidewater	4.59	4.60	3.95	4.24	4.07	4.31	4.59	4.61
Southern Piedmont	4.35	4.28	3.79	4.09	3.77	3.75	4.29	4.46
Southern Mountain	3.91	3.91	3.52	3.78	3.42	3.71	4.24	3.99
Northern Mountain	3.82	3.66	3.53	3.62	3.51	3.67	4.07	3.83
Northern Piedmont	4.53	4.67	4.05	4.30	3.88	4.09	4.29	4.62
Statewide Average	4.21	4.18	3.74	3.96	3.71	3.88	4.27	4.30

To determine what satisfaction factors are important to Virginia deer hunters, those who use a gun to hunt deer were asked to evaluate 21 different satisfaction variables on the 1994-95 survey. Hunters were asked to make their evaluation of satisfaction from 2 perspectives: what constitutes an ideal hunting season versus their actual experience during the hunting season just completed.

In an ideal season, Virginia deer hunters ranked feeling safe in the field as the most important satisfaction component, followed by seeing deer signs while hunting, seeing deer while hunting, and having the challenge of deer hunting (Figure 18). Important factors of actual satisfaction with the most recent season included being close to nature, having the challenge, seeing deer sign, and just getting away.

For any satisfaction factor, the direction and amount of difference between the ideal and the actual rating is a measure of the hunter's satisfaction/dissatisfaction on that factor. Four satisfaction factors displayed a negative difference greater than 1 between the ideal and actual experiences. Factors where greatest dissatisfaction was displayed included seeing deer (-1.45), seeing a trophy deer (-1.39), crowding (-1.16), and safety (-1.00). Factors reflecting greatest satisfaction among deer hunters involved getting away, getting a shot, maintaining equipment, and being close to nature.

Results from the 1994-95 Virginia survey confirmed previous work which suggests that hunters' perception of deer population size is the single most important satisfaction variable under management control, and deer management programs that maintain populations at low densities (≤MSY) likely will produce dissatisfied hunters. Although hunters who use a gun to hunt deer expressed dissatisfaction with existing opportunities to see deer while hunting, their expectations and degree of satisfaction in terms of hunter success (i.e., getting a shot) appear to have been met.

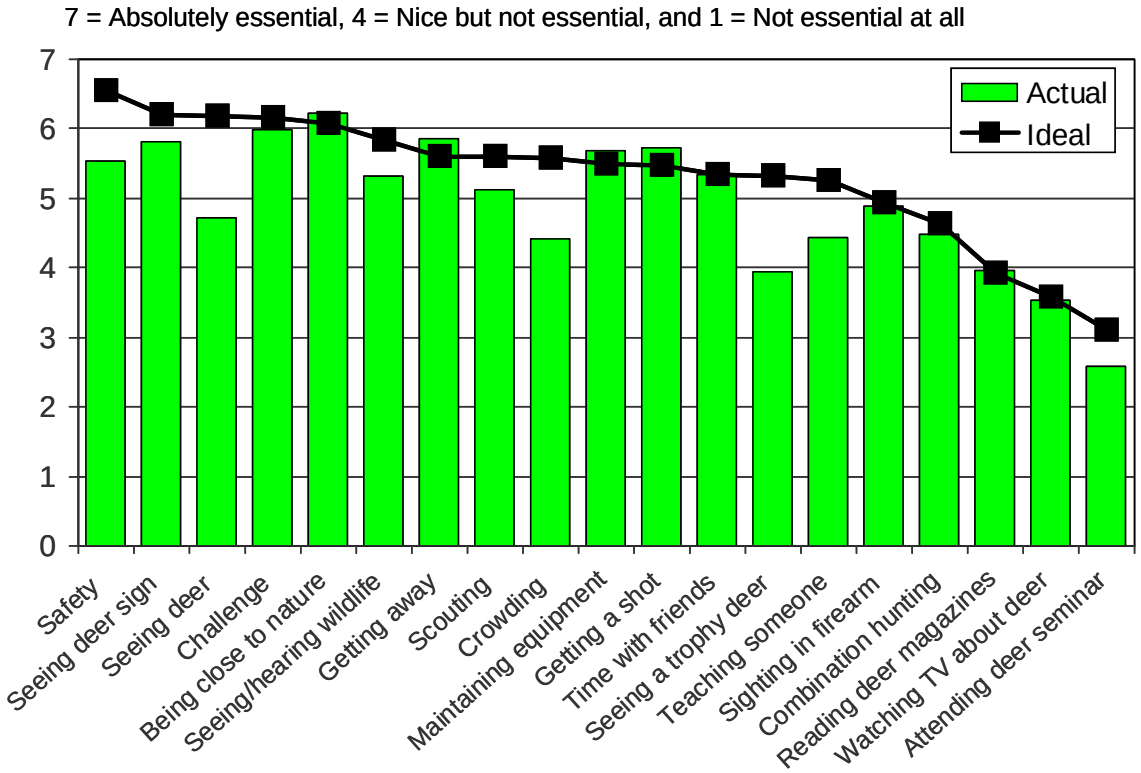

Figure 18. 1994 Virginia gun hunter satisfactions, ideal versus actual.

Participants in the 2004-05 hunter survey generally rated deer populations in the area in which they hunted most as "moderate" or higher (statewide mean response = 4.7, rated on a 7-point Likert scale; 1: low, 4: moderate, 7: high). These ratings ranged from a low of 4.1 in the Northern Mountains to 5.0 in the Tidewater. Of those hunters surveyed, 47.0% statewide reported that the number of deer in the area they hunted during 2004-05 had remained about the same as in previous years; 27.6% said deer populations had increased since previous years, and 23.1% said populations had declined.

Another attribute of hunter satisfaction is the expectation for VDGIF to address hunter concerns in management decisions. When asked, *"In your opinion, how well does the DGIF incorporate public input into its deer management decisions?,"* participants in the 2004-05 hunter survey statewide expressed an opinion of slightly below "adequate" (mean response = 3.89, rated on a 7-point Likert scale; 1: poor, 4: adequate, 7: excellent).

Surveys conducted by Responsive Management, Inc. of Harrisonburg, VA during 2000 explored opinions, attitudes, and experiences of hunters and other citizens regarding VDGIF and various attributes of wildlife management in Virginia. Responsive Management conducted 4 separate telephone surveys of the following constituents: 1) the general population, anglers, and nonconsumptive wildlife enthusiasts, 2) Virginia landowners, 3) Virginia hunters and 4) Virginia boaters. VDGIF funded a survey of all major internal and external constituent groups to determine VDGIF priorities following passage of House Bill 38. The 1998 Virginia General Assembly unanimously approved House Bill 38, a measure that allocates a portion of existing sales tax collections to VDGIF.

According to the hunter survey conducted relative to passage of House Bill 38, 89% of all hunters expressed satisfaction with their hunting experiences during the period 1998 to 2000. Deer, turkey, squirrel, and dove hunters expressed highest levels of satisfaction. The survey also found that 85% of hunters were satisfied with their deer hunting experience during the 1997-1998 season. Most hunters (55%) believed that VDGIF should provide more deer hunting opportunities, 37% wanted the same amount, and 3% wanted less deer hunting opportunities.

Deer Hunter-Citizen Conflicts----The landowner survey conducted relative to passage of House Bill 38 revealed that, during the period of 1998 to 2000, trespassing was the most common problem landowners (of more than 40 acres) had with hunters of all types of game in Virginia – both those who do and do not use dogs. Data from this survey did not permit comparison of trespassing complaints between deer hunters and other hunters, nor among different types of deer hunters.

VDGIF personnel routinely receive complaints from residents and other hunters about trespass, violation of privacy, and interference from deer hunters who use dogs. Investigations of many complaints eventually reveal that no trespass violations of law actually have occurred. Code of Virginia §18.2-136 permits the retrieval of hunting dogs on the property of another without permission from the owner, provided weapons or vehicles are not taken on the property.

The subdivision of large tracts of timber and agricultural lands, the expansion of residential development into and adjacent to traditional hunting areas, and changing demographics (e.g., more urban residents, more properties where hunting dogs are not used) have made hunting with dogs more difficult and have led to increased conflict between landowners and hunters or their dogs. Citing such conflicts, International Paper and other timber companies have recently banned the use of dogs for hunting deer on portions of their land holdings in several southern states. In 2003, Georgia Department of Natural Resources enacted requirements for minimum contiguous acreages and permits for clubs that hunt deer with dogs.

Nonconsumptive Deer Demands

In addition to hunting, deer watching is an important recreational activity in Virginia. According to the 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, nonconsumptive wildlife activities (e.g., observing and photographing wildlife) contributed an additional $789 million dollars to Virginia's economy. The survey related to House Bill 38 found that 20% of all Virginians reported making at least 1 trip during the period 1998 to 2000 for the primary purpose of observing, photographing, or feeding

wildlife (excludes trips to zoos or museums). Of trips made by noncomsumptive users, more were made to view white-tailed deer (69%) than any other species.

Deer Damage Demands

Demands placed on deer managers are not related only to recreation. Much of the pressure to change management direction for deer during the late 1980s and early 1990s was attributed to the adverse effects of deer. Examples of non-hunter demands commonly associated with Virginia's deer herds include crop depredation, deer-vehicle collisions, urban deer conflicts, and deer ecosystem impacts.

The survey related to House Bill 38 revealed that 42% of Virginia landowners (with more than 40 acres) had experienced a problem with nuisance animals or damage to their lands during the period 1998 to 2000. Deer were the most commonly cited problem among landowners in every region except southwestern Virginia. Nearly 30% of respondents reported property damage from deer (from 3% in southwestern Virginia to 48% in the southern Piedmont). Crops, gardens, and vegetables were the most commonly damaged property. Despite these stated problems with deer, >50% of respondents who reported deer damage considered their damage to be slight. Over 63% (81% in southwestern Virginia) of respondents indicated that they enjoy seeing and having deer around; 25% enjoyed a few deer, but worried about the problems they cause; and only 4% indicated that they generally regard deer as a nuisance.

Similar results were obtained in a telephone survey conducted during February-March 2005 by Responsive Management. Of the 23% of Virginians who reported they had problems with wild animals and/or birds within the past 2 years, more had problems with deer (49%) than raccoons (16%), opossums (10%), skunks (9%), birds (7%), squirrels (6%), or any other type of wildlife. Damage to yards (37%) and gardens (34%) were the two most common kinds of problems reported by the citizens who had damage.

Deer Crop Damage----A committee established by the VDGIF to investigate deer damage estimated the amount of agricultural crop damage caused by deer in Virginia in 1992 at approximately $11.4 million. The majority of this damage was to soybeans ($6.3 million), peanuts ($2.0 million), and orchards ($1.9 million). Damage to property in urban/suburban environments (e.g., damage to ornamental plantings, shrubbery, vegetable gardens) was not estimated.

In fall 1996, a study of deer damage in Virginia, funded by the Virginia Deer Hunters Association and conducted by Virginia Tech, surveyed 1,506 agricultural producers and homeowners to evaluate their beliefs and opinions about deer and deer damage. Overall, 732 completed questionnaires were returned (471 from producers, 261 from homeowners). Among all respondents, 58% reported experiencing deer damage during 1995. Although producers were more likely to report damage than homeowners (71% versus 36%, respectively), the severity of damage being reported by both producers and homeowners was similar. However, the occurrence and severity of damage varied greatly among commodity groups, where producers of soybeans, peanuts, and tree fruits reported greater damage severity and producers of forage crops typically reported less severe damage. Among all respondents, 70% indicated a desire to reduce Virginia's deer population. As expected, the occurrence and severity of damage greatly affected respondents' desire for future population management.

To gauge the demands imposed by crop damage, the VDGIF uses the number of deer kill permits issued, by management unit, as an index. The number of kill permits issued statewide to manage deer damage has risen steadily, due largely to an increase in the use of kill permits in urban areas since 1999; kill permits issued for agricultural damage has essentially leveled off (Figure 19).

Deer Vehicle Collisions----Deer-vehicle collisions are one of the most critical types of deer damage in Virginia. Although reliable data are not available, thousands of deer-vehicle collisions occur in the Commonwealth each year. According to the House Bill 38 survey, 16% of all Virginia households had at least 1 family member involved in a collision with a deer in Virginia during the period 1998 to 2000. According to a telephone survey conducted during February-March 2005 by Responsive Management, 4% of Virginians had a vehicle collision with a deer while driving (3%) or riding (2%) on Virginia’s roads or highways within the past year. Accidents reported by police that result in human fatalities, human injuries, or property damage have increased significantly over the last 30 years (Appendix 3). The increase in deer-vehicle collisions in Virginia can be attributed to growing deer and human populations. The growth in human population has

increased traffic volume and the number of roads, fragmenting deer habitats. As a result, deer are crossing busier highways more often. In 2003, total property damage reported for deer-vehicle collisions was $13,443,412, or $2,530 per accident. Given that many accidents are not reported, this total probably is much higher. Deer-vehicle collisions result in <1% of all human casualties in motor vehicle accidents in Virginia. Between 1999 and 2003, an average of 2.2 of 839 (0.26%) total fatal accidents and 384 of 54,831 (0.70%) total injury accidents per year involved deer.

Urban Deer Conflicts----Urban deer conflicts are one of the fastest growing deer management issues in Virginia. Over the past decade, VDGIF has received requests for information and assistance from numerous city and county governments, landowner associations, and private landowners regarding urban deer issues. Management of deer in urban environments often involves deer populations that traditionally have not been hunted, that occur in residential areas, and that have experienced significant population growth, all of which can create the potential for damage to ornamental plants and property. To address the growing urban deer problem, VDGIF developed several site-specific programs to reduce deer populations (e.g., kill permits, DPOP, urban archery hunting). Managers anticipate that urban deer populations, and the unique management challenges they present, will increase significantly in the northern Piedmont and Tidewater regions as human populations there also continue to expand.

During 2004, the Conservation Management Institute at Virginia Tech conducted a survey of administrative leaders of cities, towns, and counties in Virginia to gauge their community's experiences with nuisance animals. Of the 65 localities that responded, nearly half (32) ranked deer among the top 10 most important nuisance species; 14 (25%) localities ranked deer number one among nuisance species. For comparison, 10 localities ranked dogs most important, and 7 ranked cats as most important.

Deer Ecosystem Impacts----Deer ecosystem impacts have become more of a management concern in Virginia as the density of deer herds has increased and forests have matured. The effects of deer on forest composition and regeneration, habitat structure, and species diversity are well-documented. In certain parks and other forested areas in the Commonwealth, deer have removed much of the understory vegetation up to a level they can reach, leading to conspicuous "browse lines." Heavy deer browsing can diminish nutritive value of habitats for deer, displace wildlife communities that are dependent upon understory vegetation (e.g., neotropical migrant songbirds, small mammals), prevent the regeneration of valuable forest tree species (e.g., oaks), and damage certain unique or sensitive plant communities.

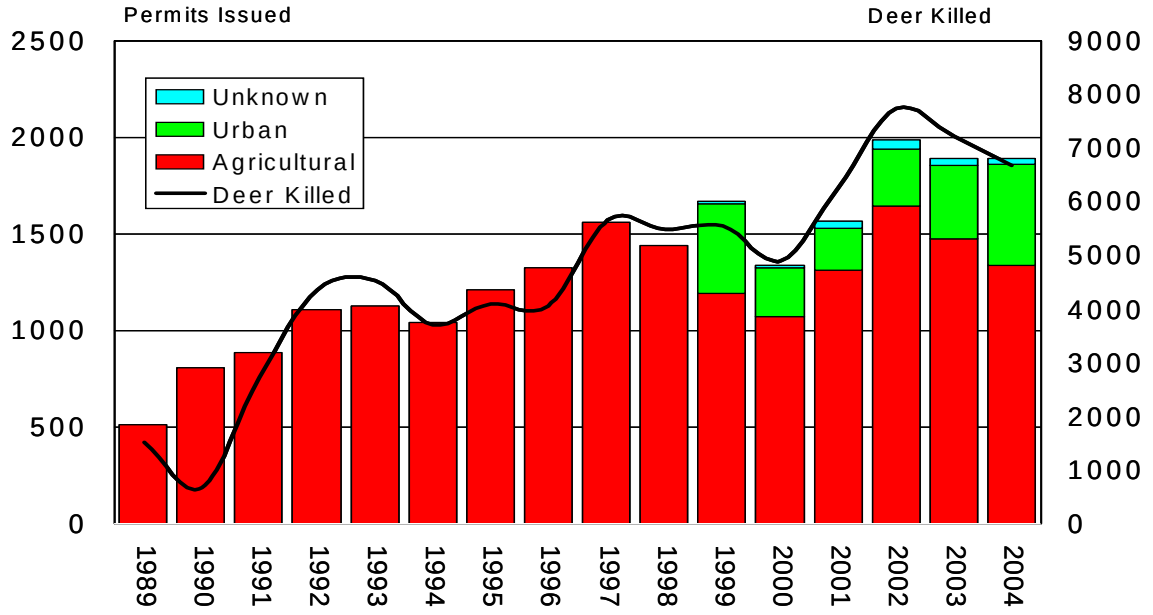

Figure 19. Virginia deer kill permits issued, 1989-2004.

Public Perceptions of Deer Populations

According to the survey related to House Bill 38, 3 times as many Virginians believed that deer populations in their counties should be decreased as those who desired an increase (Table 4). Regions shown are VDGIF administrative regions (Figure 20), which are similar to, but do not overlap directly with, the physiographic regions of Virginia (Figure 12). The desire for fewer deer was most apparent in the northern and southern Piedmont regions (2 and 5). The desire for more deer was strongest in the mountain regions (3 and 4), even though more citizens there still preferred to see fewer deer overall. Even hunters were split in their belief of whether there were too many (21%) or too few deer (28%) in the part of Virginia where they hunted most; 48% of hunters thought the deer population was about right.

Table 4. Citizen opinions (% respondents) about the size of deer populations that existed in the county of residence, as expressed by VDGIF administrative region and statewide, in 2000 (VDGIF administrative regions are illustrated in Figure 20).

Opinion*	State	Region 1	Region 2	Region 3	Region 4	Region 5
Increased	10	12	8	18	16	7
Remain the same	47	48	52	41	49	46
Decreased	32	21	34	31	29	38
Don't know/neutral	11	19	7	10	6	9
Number of respondents	806	162	160	161	161	162

* Question: "In your opinion, should the deer population in your county be...."

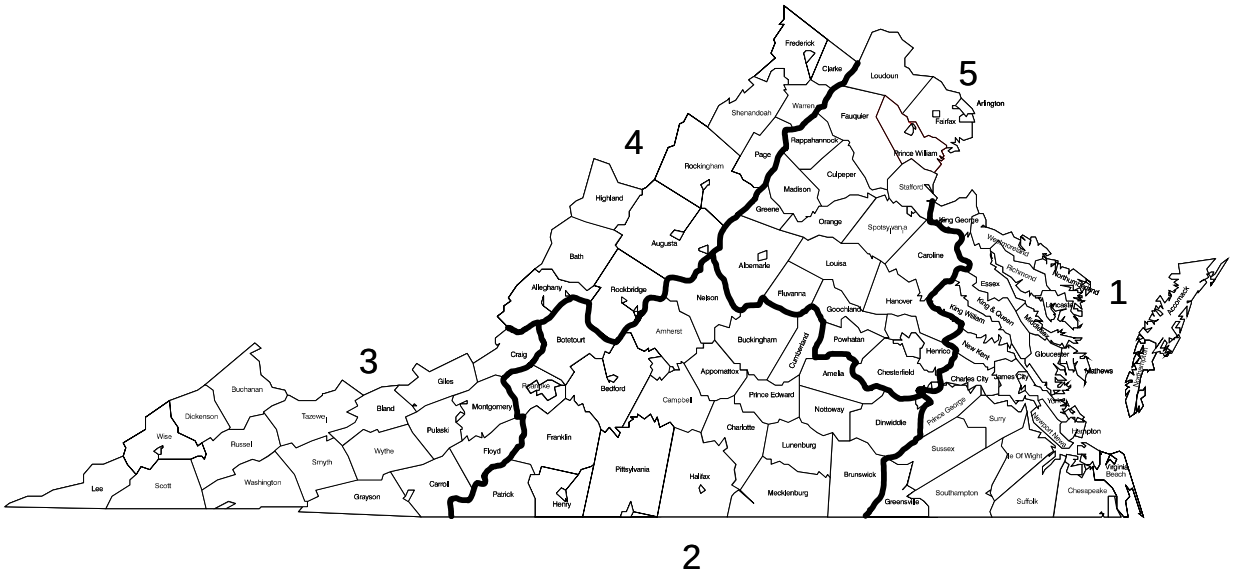

Figure 20. VDGIF administrative regions.

Participants in the 2004-05 hunter survey were asked, "What advice would you give the Department regarding how to manage the deer herd?" Statewide, 22.1% of respondents advised to increase the deer herd, 42.3% advised to stabilize the deer herd, and 21.5% advised to decrease the deer herd; 14.1% offered no opinion. The greatest demand for increasing the deer herd was in VDGIF administrative region 4 (31.8% of hunters) and the greatest demand for decreasing the deer herd was in region 2 (25.9% of hunters; see Figure 20 for regions).

During spring 2005, 39 high school science teachers in Virginia agreed to participate in a deer education and survey project conducted by VDGIF. We provided each teacher with educational materials about white-tailed deer biology and management for the students and surveys about deer populations and deer-related experiences for parents or guardians of students. We received 1,290 parent surveys from 28 schools (35 classes) in 15 counties and 5 cities (Appendix 4). Overall, more than twice as many parents considered the deer populations in their area to be too large (30%) than too small (13%). However, in most areas, a majority of respondents indicated that the deer population was the right size.

VDGIF also surveyed all 95 county executives and the managers of 4 cities (Chesapeake, Newport News, Suffolk, and Virginia Beach) in Virginia during 2005. Administrative officials from 65 counties (68%) and 3 of the 4 cities responded to questions regarding deer populations and the relative frequency of contact with different citizens regarding deer. Of the 65 county respondents, 44 (67%) believed their residents considered the deer population to be too large (Appendix 5). All 3 city managers believed that their residents considered deer populations to be the right size.

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SUPPORTING DOCUMENTS

An Evaluation of Deer Management Options

Ellingwood, M. R., and S. L. Caturano. 1996. An evaluation of deer management options. Publication No. DR-11. New Hampshire Fish and Game Department, Concord, NH. 16 pages.

The main contribution of this document, which was reprinted in the 1999 Virginia Deer Management Plan, was to enumerate advantages and disadvantages of different options available to manage deer populations:

(1) Use regulated hunting as a deer management tool;
(2) Allow nature to take its course;
(3) Trap and transfer excess deer to other locations;
(4) Use fencing and repellents to manage conflicts with deer populations;
(5) Use fertility control agents to regulate deer populations;
(6) Provide supplemental food to alleviate conflicts with biological and cultural carrying capacity;
(7) Control deer herds with sharpshooters; and
(8) Reintroduce predators to control deer populations.

This document concluded that regulated hunting is the most practical and cost-effective means to control free-ranging deer populations in most settings. Alternatives to regulated hunting typically are limited in applicability, prohibitively expensive, logistically impractical, or technically infeasible.

Managing White-tailed Deer in Suburban Environments: A Technical Guide

DeNicola, A. J., K. C. VerCauteren, P. D. Curtis, and S. E. Hygnstrom. 2000. Managing white-tailed deer in suburban environments: a technical guide. Cornell Cooperative Extension, Ithaca, NY. 52 pages. Available online at www.dgif.virginia.gov.

This publication provides an overview of the complex social and biological issues involved in managing white-tailed deer and addresses the usefulness of various options to resolve localized deer-human conflicts.

Major content areas include:

- Biology of the white-tailed deer
- Regulations regarding white-tailed deer
- Deer ecology and management
- Human dimensions and deer management
- Developing an integrated management strategy
- Estimating deer population size
- Management techniques (non-lethal, vehicle collision reduction, population reduction)
- Experimental deer management (fertility control)
- Deer damage control supplies and materials information
- Resource contacts

This document stresses the need for public involvement when developing community deer management programs. Integrating proven techniques into a long-term strategy will be more successful than seeking simple, quick fixes. Although non-lethal methods may reduce problems at specific sites, lethal population reduction programs usually are required to resolve community-wide conflicts. Because reproductive output of deer that live in urban environments commonly is high, a decision to postpone active management often will lead to greater difficulty when efforts are implemented in the future.

ACCOMPLISHMENTS OF THE 1999 VIRGINIA DEER MANAGEMENT PLAN

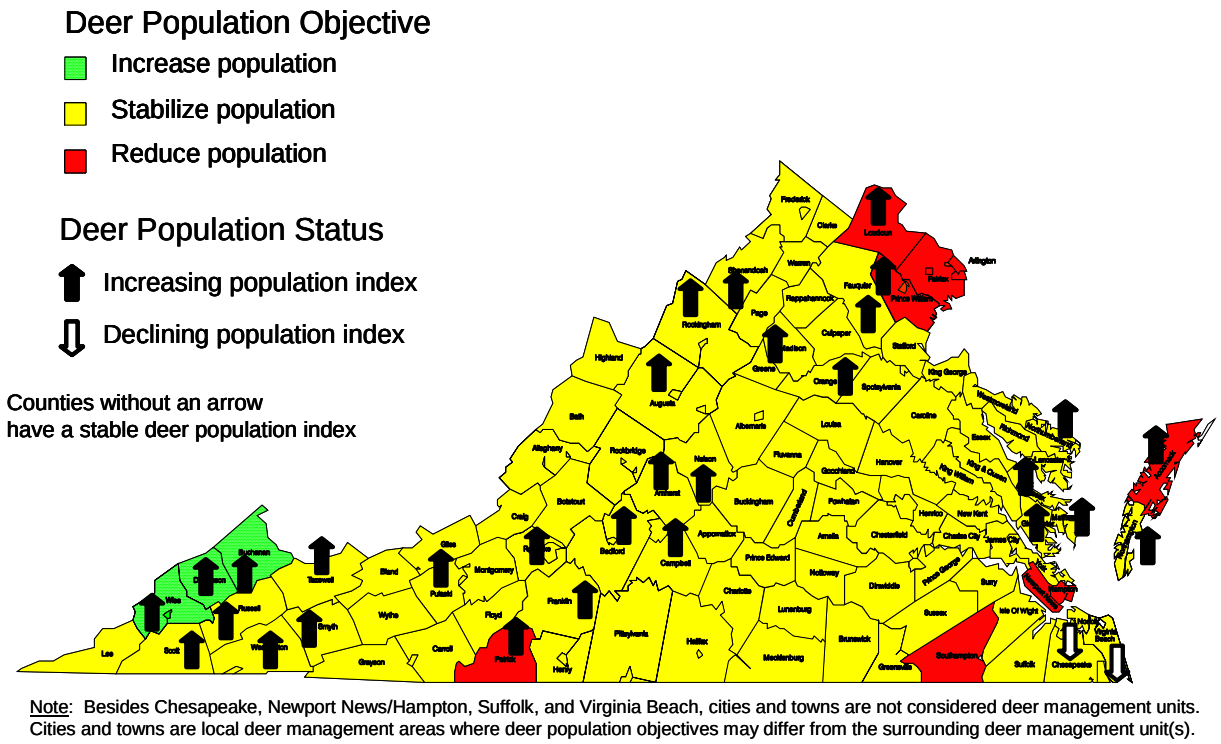
Progress in Meeting Plan Objectives

The 1999 Virginia Deer Management Plan contained 16 objectives that were prioritized by the Deer Management Planning Committee into high, medium, or low categories through use of cluster analysis (see Appendix XI, page 68 of the 1999 Deer Management Plan). Tables 5-7 and Figures 21-22 below provide a summary of progress toward meeting each objective since plan implementation in 1999 through January 2004.

Table 5. Progress toward achieving objectives identified in the 1999 Deer Management Plan.

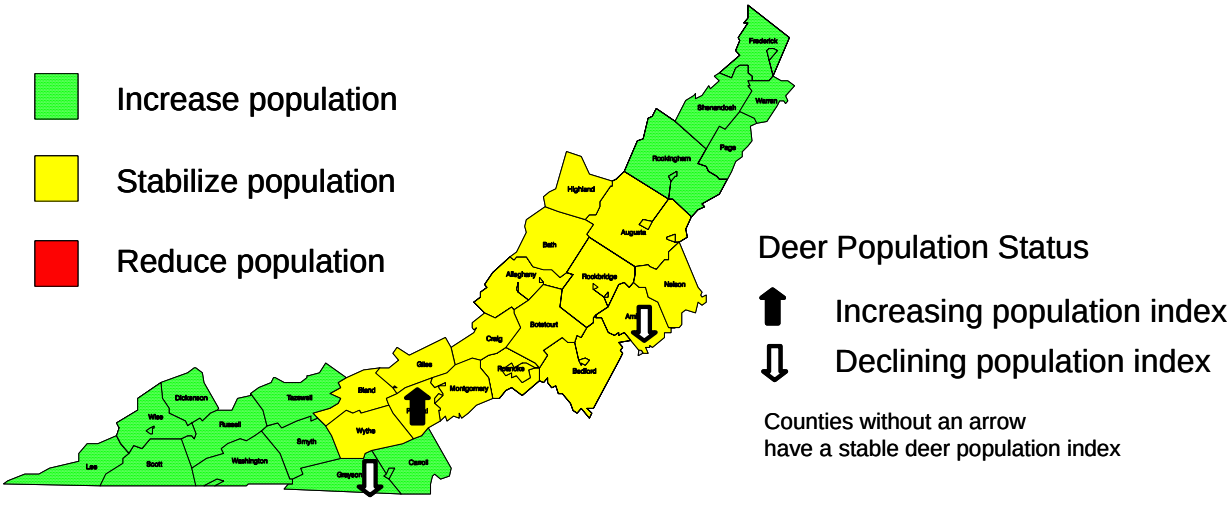
Objective by Goal Area	Priority - Rank (1999 Plan)	Objective Met? (1999-2004)	Explanation
Population			
To determine the cultural carrying capacity (CCC) by management unit.	High - 3	No	Objectives revised 2006
To meet deer population management objectives by management unit.	High - 3	Yes, 67% of private and 45% of public units	See Tables 6 and 7 below.
To identify and develop/continue management programs for unique deer management areas within traditional management units.	High - 3	Yes	Continued DMAP, DCAP, kill permits; developed DPOP and urban archery
Habitat			
To determine the status of deer habitat by management unit.	Medium - 4	Yes	Updated: 1999 National Land Cover Dataset
In cooperation with the USFS, implement habitat management practices and improvements beneficial to deer on 1% of National Forest lands annually.	Medium - 9	No	1999-2004 annual average of 9,723 ac (0.54%) of timber harvest and prescribed fire.
Damage			
To quantify agricultural, urban, ecosystem, vehicular, and forestry- related deer damage.	High - 2	No	Agricultural/urban survey conducted 1996
To reduce the demand for out-of-season kill permits for deer to $\leq$ 1,000 permits annually.	Medium - 6	No	1,100-1,600 for agricultural damage; 200-500 for urban
To develop a management program for urban deer.	High -1	Yes	Urban archery, DPOP

Objective by Goal Area	Priority - Rank (1999 Plan)	Objective Met? (1999-2004)	Explanation
To develop a quantitative objective for deer-vehicle collisions.	Medium - 8	No	In progress with VDOT
Recreation			
To manage deer-related recreation to yield zero (0) deer hunting-related accidents annually.	Medium - 4	No	Annual average of 41 total and 2.6 fatal
To manage deer-related recreation to yield ≥3,800,000 days spent afield deer hunting by ≥230,000 deer hunters annually.	Low - 10	No, hunter days Yes, hunter numbers	Expanded opportunities (youth antlerless, Saturday openings, extra doe days, firearms season expansion)
To manage deer-related recreation to yield a statewide deer gun hunter satisfaction index (HSI) of ≥ 4.0 (adequate) on both public and private lands in all regions.	Medium - 6	Yes	Most recent data point (2004) was 4.30 (Table 3)
To manage deer-related recreation to yield current levels of deer viewing opportunities.	Low -11	Unknown	Unknown level to monitor
Education			
To develop public information educational materials and programs related to Virginia's deer management program.	High - 3	Yes	Developed online FAQ's, brochures, maps, harvest reporting, etc.
Administration			
To achieve a 50% increase in VDGIF deer program funding, excluding inflation, by the 2004 fiscal year.	Medium - 7	No	FY 1999 expenditures: $335,691; FY 2004: $351, 919; See Appendix 6
To provide annual assessments of progress toward meeting deer management plan objectives and to begin work on a revised plan by January 1, 2003.	Medium - 5	No	Began work on new plan in mid-2004



Note: Besides Chesapeake, Newport News/Hampton, Suffolk, and Virginia Beach, cities and towns are not considered deer management units. Cities and towns are local deer management areas where deer population objectives may differ from the surrounding deer management unit(s).

Figure 21. 2003 DGIF private land deer population status by county, relative to population objectives in 1999 Deer Plan.



Note: Besides Chesapeake, Newport News/Hampton, Suffolk, and Virginia Beach, cities and towns are not considered deer management units. Cities and towns are local deer management areas where deer population objectives may differ from the surrounding deer management unit(s).

Figure 22. 2003 DGIF public land deer population status by county, relative to population objectives in 1999 Deer Plan.

Progress in Meeting Deer Population Objectives

Deer population management objectives (i.e., reduce, stabilize, or increase population) are set on a county/city management unit basis. Deer population objectives for private and public lands that were developed as a part of the 1999 Virginia Deer Management Plan are listed in Tables 6 and 7. These tables indicate whether the population objectives were met for each management unit. Trend analysis indicates that population objectives were met in 66 (67%) of 98 private land deer management units, but were not met in the remaining 32 units (33%). Objectives were met in 14 (45%) of 31 public land deer management units, but were not met in 17 (55%).

Deer population trends were evaluated by examining the annual rate of change in the population index (i.e., antlered buck harvest) over the 10-year period from 1994-2003. An exponential regression ($y = ae^{rt}$; where, y = population index, a = intercept, $e = 2.718$, r = instantaneous rate of change, and t = year) was used to determine trends in population. The annual rate of change ($R = e^r - 1$. Statistical analyses were run using SAS (SAS Institute Inc. 2004. SAS OnlineDoc® 9.1.2**.** SAS Institute Inc., Cary, NC).

The status of the deer population in each county was considered to be increasing or decreasing if the annual rate of change in the population index was >2.26% (either positive or negative) and the statistical significance level of the exponential regression model was $p < 0.10$. Annual rates of change that exceeded 2.26% represent a change of at least 25% in the population index over the decade ($1.0226^{10} = 1.25$). Counties that displayed a rate of change between 0 and $\pm$2.26 were deemed to be stable.

Table 6. 2003 Virginia private land deer population status by county or city, relative to population objectives in the 1999 Deer Plan.

County/City	R^1	P^2	Status	Objective	Objective Met?
Accomack	3.42%	<0.01	Increasing	Reduce	No
Albemarle	0.73%	0.55	Stable	Stabilize	Yes
Alleghany	0.12%	0.89	Stable	Stabilize	Yes
Amelia	-1.06%	0.53	Stable	Stabilize	Yes
Amherst	3.32%	0.01	Increasing	Stabilize	No
Appomattox	0.93%	0.38	Stable	Stabilize	Yes
Augusta	3.31%	0.01	Increasing	Stabilize	No
Bath	-2.03%	0.01	Stable	Stabilize	Yes
Bedford	3.68%	<0.01	Increasing	Stabilize	No
Bland	1.76%	0.11	Stable	Stabilize	Yes
Botetourt	-0.14%	0.91	Stable	Stabilize	Yes
Brunswick	0.02%	0.99	Stable	Stabilize	Yes
Buchanan	14.19%	<0.01	Increasing	Increase	Yes
Buckingham	-0.72%	0.63	Stable	Stabilize	Yes
Campbell	2.39%	0.09	Increasing	Stabilize	No
Caroline	-1.04%	0.48	Stable	Stabilize	Yes
Carroll	0.75%	0.31	Stable	Stabilize	Yes
Charles City	1.43%	0.48	Stable	Stabilize	Yes
Charlotte	-1.35%	0.42	Stable	Stabilize	Yes
Chesapeake	-2.63%	0.03	Decreasing	Stabilize	No
Chesterfield	-1.08%	0.44	Stable	Stabilize	Yes
Clarke	0.10%	0.92	Stable	Stabilize	Yes
Craig	0.88%	0.55	Stable	Stabilize	Yes
Culpeper	1.87%	0.08	Stable	Stabilize	Yes

County/City	R^1	P^2	Status	Objective	Objective Met?
Cumberland	-0.89%	0.60	Stable	Stabilize	Yes
Dickenson	13.08%	0.01	Increasing	Increase	Yes
Dinwiddie	0.35%	0.74	Stable	Stabilize	Yes
Essex	-0.23%	0.85	Stable	Stabilize	Yes
Fairfax	0.40%	0.63	Stable	Reduce	No
Fauquier	4.17%	<0.01	Increasing	Stabilize	No
Floyd	2.01%	0.04	Stable	Stabilize	Yes
Fluvanna	-0.31%	0.86	Stable	Stabilize	Yes
Franklin	5.24%	<0.01	Increasing	Stabilize	No
Frederick	1.21%	0.19	Stable	Stabilize	Yes
Giles	1.26%	0.29	Stable	Stabilize	Yes
Gloucester	4.23%	0.01	Increasing	Stabilize	No
Goochland	-1.46%	0.34	Stable	Stabilize	Yes
Grayson	-1.00%	0.36	Stable	Stabilize	Yes
Greene	1.37%	0.23	Stable	Stabilize	Yes
Greensville	-0.67%	0.48	Stable	Stabilize	Yes
Halifax	0.48%	0.66	Stable	Stabilize	Yes
Hanover	2.02%	0.07	Stable	Stabilize	Yes
Henrico	-1.83%	0.24	Stable	Stabilize	Yes
Henry	0.42%	0.75	Stable	Stabilize	Yes
Highland	0.37%	0.80	Stable	Stabilize	Yes
Isle of Wight	0.46%	0.66	Stable	Stabilize	Yes
James City	0.09%	0.94	Stable	Stabilize	Yes
King & Queen	0.54%	0.70	Stable	Stabilize	Yes
King George	-1.82%	0.25	Stable	Stabilize	Yes
King William	0.84%	0.47	Stable	Stabilize	Yes
Lancaster	2.43%	0.12	Stable	Stabilize	Yes
Lee	1.19%	0.21	Stable	Stabilize	Yes
Loudoun	3.19%	<0.01	Increasing	Reduce	No
Louisa	1.19%	0.32	Stable	Stabilize	Yes
Lunenburg	-0.90%	0.59	Stable	Stabilize	Yes
Madison	3.94%	<0.01	Increasing	Stabilize	No
Mathews	5.40%	0.01	Increasing	Stabilize	No
Mecklenburg	1.92%	0.11	Stable	Stabilize	Yes
Middlesex	2.56%	0.07	Increasing	Stabilize	No
Montgomery	1.99%	0.03	Stable	Stabilize	Yes
Nelson	2.61%	0.04	Increasing	Stabilize	No
New Kent	0.35%	0.85	Stable	Stabilize	Yes
Newport News/Hampton	0.42%	0.83	Stable	Reduce	No
Northampton	3.01%	<0.01	Increasing	Stabilize	No
Northumberland	2.82%	0.04	Increasing	Stabilize	No
Nottoway	0.39%	0.82	Stable	Stabilize	Yes
Orange	2.83%	0.01	Increasing	Stabilize	No
Page	0.49%	0.52	Stable	Stabilize	Yes
Patrick	2.42%	0.02	Increasing	Reduce	No

County/City	R^1	P^2	Status	Objective	Objective Met?
Pittsylvania	0.07%	0.95	Stable	Stabilize	Yes
Powhatan	-1.85%	0.32	Stable	Stabilize	Yes
Prince Edward	-0.09%	0.96	Stable	Stabilize	Yes
Prince George	0.51%	0.62	Stable	Stabilize	Yes
Prince William	3.99%	<0.01	Increasing	Reduce	No
Pulaski	2.49%	0.03	Increasing	Stabilize	No
Rappahannock	1.97%	0.06	Stable	Stabilize	Yes
Richmond	0.46%	0.82	Stable	Stabilize	Yes
Roanoke	4.74%	<0.01	Increasing	Stabilize	No
Rockbridge	-0.97%	0.39	Stable	Stabilize	Yes
Rockingham	3.98%	<0.01	Increasing	Stabilize	No
Russell	5.05%	<0.01	Increasing	Stabilize	No
Scott	5.30%	<0.01	Increasing	Stabilize	No
Shenandoah	2.97%	0.01	Increasing	Stabilize	No
Smyth	4.29%	<0.01	Increasing	Stabilize	No
Southampton	-1.38%	0.17	Stable	Reduce	No
Spotsylvania	2.27%	0.12	Stable	Stabilize	Yes
Stafford	2.25%	0.07	Stable	Stabilize	Yes
Suffolk	0.78%	0.36	Stable	Stabilize	Yes
Surry	0.39%	0.69	Stable	Stabilize	Yes
Sussex	-1.31%	0.19	Stable	Stabilize	Yes
Tazewell	2.38%	<0.01	Increasing	Stabilize	No
Virginia Beach	-3.20%	0.01	Decreasing	Stabilize	No
Warren	-1.58%	0.29	Stable	Stabilize	Yes
Washington	2.94%	<0.01	Increasing	Stabilize	No
Westmoreland	-0.14%	0.92	Stable	Stabilize	Yes
Wise	4.40%	0.01	Increasing	Increase	Yes
Wythe	0.46%	0.66	Stable	Stabilize	Yes
York	0.96%	0.47	Stable	Stabilize	Yes

[1] R = Percent annual change in population index. Values less than -2.26% and values greater than 2.26% are considered significant ($1.0226^{10} = 1.25$ or a 25% increase or decrease over the 10-year period).

[2] p = Statistical significance level of exponential regression model. Values ($p < 0.10$) are considered significant

Table 7. 2003 Virginia public land deer population status by county, relative to population objectives in the 1999 Deer Plan.

County	*R*[1]	*P*[2]	Status	Objective	Objective Met?
Alleghany	-2.28%	0.28	Stable	Stabilize	Yes
Amherst	-2.67%	0.02	Decreasing	Stabilize	No
Augusta	0.73%	0.42	Stable	Stabilize	Yes
Bath	-2.72%	0.25	Stable	Stabilize	Yes
Bedford[3]	0.14%	0.93	Stable	Stabilize	Yes
Bland	-2.23%	0.17	Stable	Stabilize	Yes
Botetourt	-1.57%	0.28	Stable	Stabilize	Yes
Carroll	-1.00%	0.59	Stable	Increase	No
Craig	-1.78%	0.32	Stable	Stabilize	Yes
Dickenson	2.97%	0.21	Stable	Increase	No
Frederick	-1.15%	0.61	Stable	Increase	No
Giles	-1.43%	0.49	Stable	Stabilize	Yes
Grayson	-4.45%	<0.01	Decreasing	Increase	No
Highland	-1.92%	0.41	Stable	Stabilize	Yes
Lee	1.98%	0.41	Stable	Increase	No
Montgomery	-1.86%	0.47	Stable	Stabilize	Yes
Nelson	0.85%	0.70	Stable	Stabilize	Yes
Page	1.46%	0.08	Stable	Increase	No
Pulaski	4.32%	0.06	Increasing	Stabilize	No
Roanoke	-1.56%	0.46	Stable	Stabilize	Yes
Rockbridge	-1.68%	0.27	Stable	Stabilize	Yes
Rockingham	-0.33%	0.85	Stable	Increase	No
Russell	0.22%	0.95	Stable	Increase	No
Scott	-2.16%	0.42	Stable	Increase	No
Shenandoah	2.55%	0.18	Stable	Increase	No
Smyth	-0.20%	0.87	Stable	Increase	No
Tazewell	-3.91%	0.28	Stable	Increase	No
Warren	-0.07%	0.97	Stable	Increase	No
Washington	-1.79%	0.24	Stable	Increase	No
Wise	1.22%	0.44	Stable	Increase	No
Wythe	-0.75%	0.60	Stable	Stabilize	Yes

[1] *R* = Percent annual change in population index. Values less than -2.26% and values greater than 2.26% are considered significant ($1.0226^{10} = 1.25$ or a 25% increase or decrease over the 10-year period).

[2] *p* = Statistical significance level of exponential regression model. Values ($p < 0.10$) are considered significant.

[3] In counties underlined public land deer kill on average represents less than 10% of the total deer kill

GOALS, OBJECTIVES, AND STRATEGIES

This section outlines and describes the goals for managing deer in Virginia through 2015. The Stakeholder Advisory Committee (SAC) developed goals with technical feedback from VDGIF staff. These goals reflect the values of a diverse public and are broad statements of principles and ideals about *what* should be accomplished with deer management in Virginia. As the underpinning for deer management direction, these guiding public values should be relatively stable over time. These goals will be reconsidered during the next revision of the Virginia Deer Management Plan in 2015.

Following each goal statement are a number of objectives. These objectives describe, with specific milestones, *how* these goals will be attained. Unlike the publicly developed goals, objectives are generally quantifiable, have deadlines for achievement, and were developed by VDGIF staff (in consultation with the SAC). The more technical deer management issues about how to achieve public values (i.e., how to achieve goals) are primarily provided via the expertise of VDGIF staff.

Strategies were also developed by VDGIF staff in consultation with the SAC. These strategies represent some approaches, techniques, and programs that will be considered to accomplish objectives. As with objectives, decisions about what strategies to use are largely the technical realm of wildlife professionals (but still with input and considerations about what techniques are most acceptable to the public). Educational strategies will be important components of accomplishing virtually every objective in the Plan.

Public goals are much less likely to need amending between plan revisions than objectives and strategies. While goals should remain relatively constant over time, specific objectives and strategies will need flexibility to respond to changing social, environmental, technical, and administrative conditions. To keep the plan relevant and responsive, specific objectives and strategies may be added, deleted, or amended by VDGIF as new information or circumstances demand. Recognizing the adaptive significance of corrective changes in management approaches, the Stakeholder Advisory Committee endorsed this flexibility in updating objectives and strategies between revisions. VDGIF staff will submit these interim updates to the SAC for review.

Population Goal

Manage local deer populations as a public resource using innovative, flexible, publicly accepted, and technically sound practices that balance:

- **the varied needs and expectations of a diverse community (cultural carrying capacity)**
- **the requirements of a biologically diverse ecosystem**
- **the anticipated future social/ecosystem demands.**

VDGIF has a legislative mandate (§29.1-103) to manage Virginia's white-tailed deer resource. The VDGIF's strategic plan states that Virginia's wildlife populations should be managed to maintain optimum populations to serve the needs of the Commonwealth. *A basic tenet of deer management in Virginia is that white-tailed deer are a public resource that can never be privately owned.* Deer, like other native wildlife, are managed in trust by VDGIF for all citizens.

Cultural carrying capacity (CCC) is defined as the number of deer that can coexist compatibly with humans. At CCC, the deer population is in balance with positive demands for deer (i.e., recreation) with the negative demands (i.e., damage). CCC is a function of the tolerance levels of human populations to deer and the effects of deer. CCC can vary widely within and among communities. Development of CCC deer management objectives are subjective and must take into account the combination of social, economic, political, and biological perspectives of the community. The CCC for deer generally occurs well below the biological carrying capacity (BCC) - the maximum number of deer that a habitat can sustain over time

Even at population levels below CCC and BCC, deer can cause significant impacts to natural ecosystems. Deer populations are to be managed not only to meet the desires of constituents, but also to protect ecosystem integrity and biodiversity.

Proactive population management entails anticipating changes in CCC and ecosystem requirements in the future. Deer population objectives and strategies should accommodate these expected future demands.

An effective public information effort is critical to the future success of Virginia's deer management programs. Public attitudes and perceptions often determine the success or failure of deer management. In the future, emphasis will need to be placed on public education to achieve deer management objectives.

Objective 1. To update deer population management objectives by management unit biennially beginning January 1, 2007.

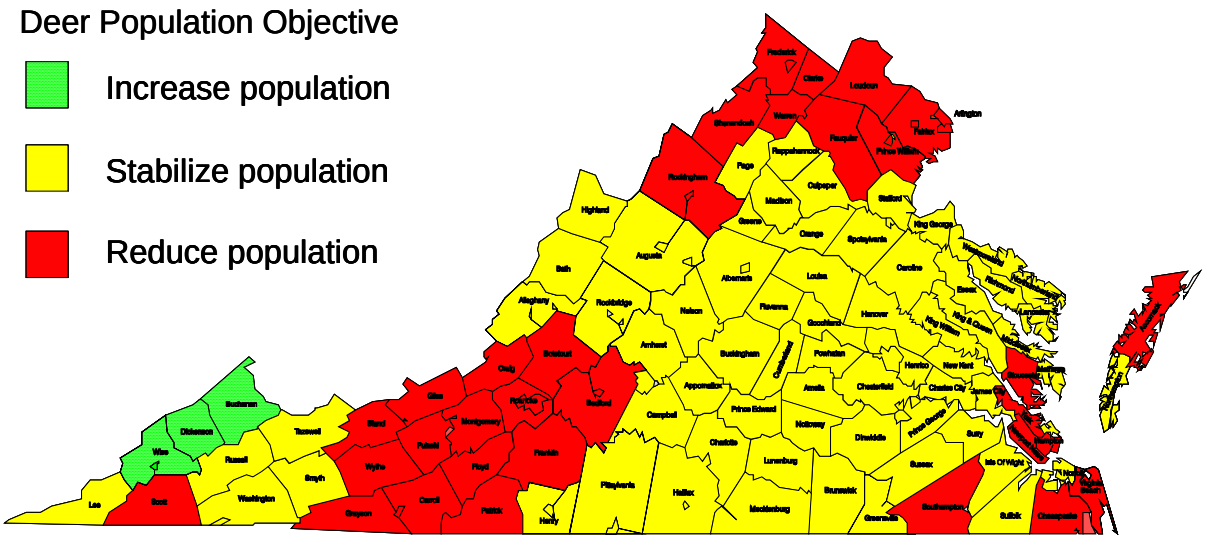
A deer management plan must have defined management units and contain four components: a measure or index of current deer population status, a population management objective, a management strategy to attain the population management objective, and a method to monitor population response (i.e., management success or failure). For deer population management purposes, there are only three logical population objectives: increase the deer population, stabilize the deer population, or reduce the deer population.

In Virginia, deer harvest objectives/regulations are set on a county basis. There are currently 99 management units ranging in size from 26 to 971 square miles in area (average = 399 square miles). These management units include every county and the cities of Chesapeake, Newport News/Hampton (combined), Suffolk, and Virginia Beach.

Deer population management objectives, as well as hunting regulations, have been differentiated between public (e.g., National Forest and VDGIF lands) and private lands for 31 counties west of the Blue Ridge Mountains (including Amherst, Bedford, and Nelson counties east of the Blue Ridge Mountains) due to differences in public demands, habitats, and accessibility. Additionally, in many counties, wildlife management areas, state parks, state forests, military areas, and national wildlife refuges have either-sex general firearms harvest regulations that differ from the county in which they are located. Lastly, general firearms season(s) regulations are split by defined boundaries in five counties (e.g., Amherst, Campbell, Nelson, Pittsylvania, and Suffolk).

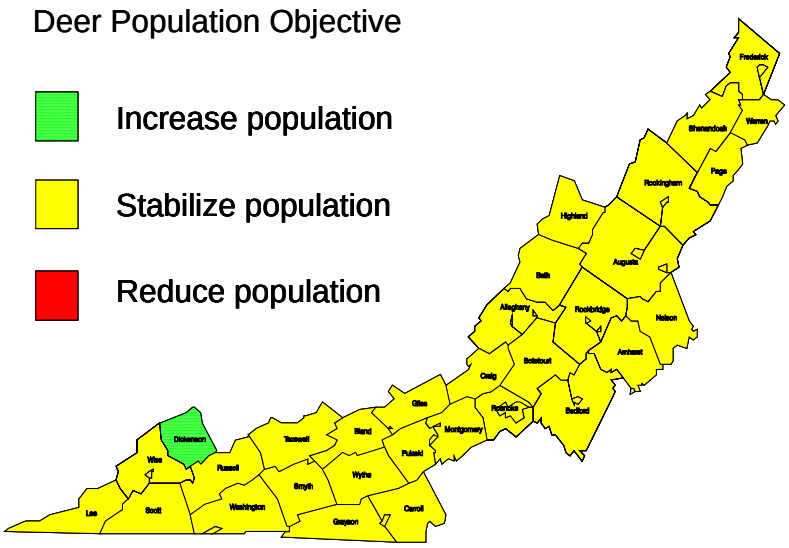
Development of deer population management objectives integrates social, economic, political, administrative, and biological perspectives. Population management objectives for 2006 (Figure 23 and 24) were derived based on VDGIF staff assessments of cultural carrying capacity and environmental impacts of deer and supplemented by information gained from two constituent surveys. Knowledge of local human-deer conflicts and constituent desires for deer is important in establishing deer population management objectives. Human population (Appendix 7) and development trends are used to forecast future human-deer conflicts. VDGIF staff routinely interacts with diverse stakeholders (e.g., agricultural producers, homeowners, hunters, environmental organizations) regarding local deer populations and human-deer conflicts. County and selected city executives – who, like VDGIF staff, are synthesizers of public opinions - were surveyed regarding their perceptions of residents' opinions about local deer populations and which constituents they hear from most frequently (inferred population objectives are shown in Appendix 5). Parents/guardians of high school students participating in a deer project in the classroom were surveyed regarding their opinions about local deer populations and their interactions with deer (e.g., watching, hunting, vehicle collisions, plant damage; inferred population objectives are shown in Appendix 4). Draft objectives proposed by staff were presented at public hunting regulations meetings. Note that Besides Chesapeake, Newport News/Hampton, Suffolk, and Virginia Beach, cities and towns are not considered deer management units. Cities and towns are local deer management areas where deer population objectives may differ from the surrounding deer management unit(s).

The challenge for deriving population management objectives is balancing social and ecosystem demands while being mindful of future trends of each. Methods/processes used to determine local CCC's should consider all deer interests (i.e., stakeholders) in the management unit, and the community and/or stakeholders should reach a consensus on the desired deer population level and objective (increase, stabilize, or decrease). In addition to stakeholder input, managers should have information on ecosystem impacts of deer in each management unit.



Note: Besides Chesapeake, Newport News/Hampton, Suffolk, and Virginia Beach, cities and towns are not considered deer management units. Cities and towns are local deer management areas where deer population objectives may differ from the surrounding deer management unit(s).

Figure 23. 2006 private land deer population objectives.



Note: Besides Chesapeake, Newport News/Hampton, Suffolk, and Virginia Beach, cities and towns are not considered deer management units. Cities and towns are local deer management areas where deer population objectives may differ from the surrounding deer management unit(s).

Figure 24. 2006 public land deer population objectives.

Strategies

a. Employ surveys and other public input methods to establish CCC by management unit.

b. Evaluate and implement, where appropriate, alternative procedures to determine CCC.

c. Define and monitor appropriate measures of biodiversity or deer impacts to ecosystems by management unit.

d. Predict future social/ecosystem trends using best available information.

e. Develop and implement an adaptive procedure for balancing CCC, ecosystem, and future considerations in setting deer population management objectives.

Objective 2. To meet deer population management objectives within 5 years after they are updated through January 1, 2015.

Although there are a number of techniques for managing deer populations in different circumstances, tradition, management efficiency, and cost effectiveness necessitate the use of hunting as the primary deer population management strategy for free-ranging deer across most of Virginia. Additionally, public input received through surveys (e.g, House Bill 38 survey) and other means indicates that the citizens of Virginia are generally supportive of deer hunting. Deer management in Virginia is predicated on the fact that herd density and health are best controlled by regulating antlerless deer harvests levels. Management objectives are accomplished by increasing or decreasing the number of either-sex deer hunting days during the general firearms season. Deer hunting is a viable, cost-efficient management tool that not only maintains a healthy deer resource, but also diminishes deer crop damage levels, deer-vehicle collision rates, and deer-ecosystem impacts. The existence of the Hunters for the Hungry Program encourages hunters to harvest deer they may not otherwise take and donate excess deer meat to food banks.

Diseases that have the potential to impact deer populations need to be prevented or managed if deer population objectives are to be met. Hemorrhagic Disease (HD), an endemic midge-borne disease of deer, is present in the Southeastern states each summer and fall. Its prevalence and significance in impacting deer populations are cyclic. The worst HD year on record occurred in 2002. Chronic Wasting Disease (CWD) is a transmissible spongiform encephalopathy known to affect white-tailed deer, mule deer, elk, and moose. The closest CWD has been found to Virginia is in Hampshire County, WV 10 miles from the Frederick County, VA line. If introduced, CWD could have a significant deer population impact unless it is quickly and effectively controlled.

Strategies:

a. Educate the public about the need for and methods for deer population management.

b. Determine social acceptability of various deer population management options using surveys and other methods.

c. Use hunting as the primary deer population management strategy where appropriate.

d. Ensure a future for deer hunting as a management tool, where appropriate:

    1. Educate hunters and public to improve awareness and sportsmanship.
    2. Develop hunter recruitment programs.

3. Ensure that regulations, laws, and ordinances do not unnecessarily restrict hunting.
4. Improve hunter access.
5. Support programs like Hunters for the Hungry Program that promote a positive image for hunters and help meet other management objectives.

e. Where hunting is deemed inappropriate or unacceptable, a combination of other management practices will be used.

f. Manage diseases, with an emphasis on prevention, that can impact deer populations:

1. Discourage supplemental feeding and other activities which unnaturally concentrate deer.
2. Regulate captive deer, including rehabilitated wild deer, to minimize risk for disease transmission to wild deer populations.
3. Remove and test illegally-held captive deer for CWD, bovine tuberculosis, and other diseases as appropriate.
4. Prevent introduction of infectious diseases using regulations and policies.
5. Manage endemic diseases to prevent deer population impacts when possible.
6. Develop and update disease surveillance and response plans as needed.
7. Educate public regarding biology and management of deer diseases.

g. Monitor effects of regulation changes.

h. Monitor population status (size, trends, condition, etc.) annually using harvest data, hunter surveys, and other methods.

i. Incorporate measures of hunter effort in monitoring deer population trends.

j. Develop procedures for monitoring those deer populations where traditional deer hunting and harvest data is not available or not representative (e.g., Fairfax County).

Objective 3. To develop or continue management programs for local deer management areas within the larger management units through January 1, 2015.

Regulations on deer hunting are designed purposefully to apply to large areas (i.e., counties), be as simple and uniform as possible, and avoid confusion. When setting regulations on this basis, one assumes that deer habitats, deer densities, hunter pressures, and public demands are similar over the entire affected area. However, these factors often vary within a management unit. As a result, regulations in some areas may be too conservative, whereas in other areas, they may be too liberal. To meet the unique management needs and challenges in such areas, alternative site-specific management regulations (e.g., public versus private lands west of the Blue Ridge Mountains) and programs must be developed and implemented (e.g., DMAP, DCAP, DPOP, out-of-season kill permits, etc.).

Local deer management areas may include national parks, battlefields, and refuges; state parks and forests; regional, county, and city parks; cities, towns, and developed sections of counties; resorts and planned communities; industrial or utility developments; military installations; government research facilities; airports; and any other areas deemed by VDGIF to merit deer management assistance beyond that provided for by state hunting regulations pertaining to the larger management unit.

Deer population management objectives for a local area may differ from that of the larger management unit. Owners or managers of local deer management areas generally set deer population management objectives within their respective areas. For most cities and other highly urbanized areas, the objective is almost always to decrease the deer population. VDGIF's role is to provide assistance to local managers to achieve these objectives.

Strategies

a. Provide site-specific deer management programs (e.g., Deer Management Assistance Program [DMAP], Damage Control Assistance Program [DCAP], Deer Population Reduction Program [DPOP], out-of season kill permits, urban archery season)

b. Provide technical assistance to communities and landowners implementing deer management programs.

c. Develop procedures for monitoring those deer populations where traditional deer hunting and harvest data is not available or not representative (e.g., Fairfax County).

Habitat Goal

While working within the constraints of diverse land ownerships, use sound science to manage deer habitat compatible with deer population, recreation, and damage goals.

White-tailed deer have specific habitat requirements, which include food, water, cover, and space. Of these 4 generic habitat components, food typically is the most critical or important. Further, habitat quality for deer is significantly correlated with soil quality, and soil fertility directly affects the quality of deer habitat. In addition to soil quality, habitat type, successional stage, and amount of habitat interspersion or edge all play large roles in determining the quality of deer habitat. In general, habitat management practices that improve soil fertility, increase the number of habitat types, revert habitat back to an earlier successional stage, or increase the interspersion of habitat types will increase biological carrying capacity for deer.

Objective 1. To update the status of deer habitat by management unit as data becomes available through January 1, 2015.

Available deer habitat is estimated on a management area basis (county/city). The quantity of deer habitat per management units is roughly estimated as the sum of forested, open/agriculture, and wetland areas. This equals the total land area in the management unit minus developed and barren areas. Land cover habitat data used in this plan was taken from U.S. Geological Survey's National Land Cover Dataset (NLCD), derived from 1992 satellite imagery. While dated, this is the most current dataset available. At the time of the printing of this plan, 2000/2001 NLCD data is available for only the Coastal Plain of Virginia, but coverage for the rest of the state is expected by 2007. Deer habitat data will be updated when the new dataset becomes available statewide.

Strategies

a. Obtain and incorporate most recent deer habitat inventory data.

b. Monitor changes in habitat status on a management unit basis. Incorporate attributes of forest age, forest type, tree stocking rate (i.e., density), habitat interspersion, etc. in addition to basic estimates of total forest cover.

Objective 2. To promote deer habitat management compatible with the needs of diverse native wildlife species and humans on private and public lands through January 1, 2015. Deer habitat management should be consistent with deer population management and deer damage objectives.

Any activity that alters deer habitats – either intentionally (e.g., forest management) or unintentionally (e.g., residential development, agriculture) - has implications for managing deer populations, deer impacts to humans, and other wildlife species. Given that nearly 90% of land in Virginia is privately owned, management practices that impact private land habitat greatly influence deer density, distribution, and condition. Actions that impact deer habitat on private lands often can increase human-deer conflicts, particularly in residential or urban areas. Habitat management practices designed primarily for deer can positively or negatively impact other wildlife species and ecosystems.

An important deer management issue in western Virginia has been the decline in deer habitat quality on National Forests. Poor soils predominate and deer habitat has never been exceptional on most National Forest lands. Consequently, deer population densities historically have been lower in mountain habitats than in valley and bottomland habitats. However, deer habitat conditions on National Forests have worsened over the last several decades for several primary reasons: fire suppression, forest succession (maturation), and reduced timber harvests.

The amount of timber harvesting - which provides deer with ground level forage and cover - has been reduced over the past 20 years due to public opposition and federal budget restrictions (Figure 13). Approximately 0.1% of the total land area on National Forests in Virginia is harvested annually. The use of prescribed fire has increased on National Forest lands (Figure 13). The success of prescribed fire in improving deer habitat depends on many factors, including site quality, stand conditions and fire prescriptions.

Deer habitat quality is also relatively poor on forested portions of many of the state WMAs, particularly in the mountains. Budget constraints have led to reduced harvests in recent years, but future projections are expected to be on par with the harvest levels seen in the past. Statewide on all WMAs, total acres harvested per year averaged 470 during the 1980s, 790 during the 1990s, and 390 during 2000-2005. Approximately 0.2% of the total land area on WMAs is harvested annually. Prescribed burning, maintenance of forest clearings, and wildlife plantings on WMAs also benefit deer.

Even without active management of forests, natural disturbances such as wind, ice storms, disease, pests, fire, etc. will produce dispersed canopy gaps where some minimal level of deer forage will be produced. However, the biological carrying capacity for deer will remain below the level that could be achieved with active forest management. Further, without management to improve deer forage on National Forests and State WMAs, it is unlikely that deer populations can be sustained at levels to meet public demands for viewing and hunting without significant deer damage to plant communities. Management activities that produce forage for deer can also reduce deer browse pressure on sensitive plant species and regenerating forest trees.

Strategies

a. Provide technical assistance to landowners for managing wildlife habitat.

b. Support habitat management objectives on public lands which seek to manipulate vegetation for early successional wildlife.

c. Promote habitat management practices that provide long-term benefits to a diversity of wildlife species:

1. Emphasize manipulation of natural vegetation (e.g., burning, disking, timber management) rather than promote more artificial methods (e.g., establishment of food plots, mineral blocks).
2. Discourage supplemental feeding of deer.

d. Cooperate with local governments, developers, and communities to ensure that impacts to deer and other wildlife are considered during development.

e. Educate public about the relationship between deer population densities and deer habitat quality and deer damage.

Damage Goal

Proactively manage deer impacts on a local basis consistent with deer population objectives and acceptable levels of damage. Manage agricultural, urban, ecosystem, vehicular, forestry, animal health, human health and safety, and other impacts caused by deer. Deer damage management should use diverse approaches and promote personal and community responsibility.

Deer management demands in Virginia can be categorized as positive demands (e.g., observation or hunting) or negative demands (e.g, deer damage). Most of the pressure for the change in deer management direction from establishing and allowing deer herd expansion to controlling population growth that has taken place over the past decade can be attributed to deer damage demands. Examples of damage demands commonly associated with deer management in Virginia include deer crop depredation, deer-vehicle collisions, urban deer conflicts, and deer ecosystem impacts.

Citizens, communities, VDGIF, and other agencies share responsibility in managing deer damage. While VDGIF has primary responsibility for managing deer populations (and therefore deer impacts) by providing opportunities and programs to control deer populations, the decisions and actions of landowners and community leaders directly influence the occurrence of local deer damage and the effectiveness of programs developed to address damage. Citizens' decisions about planting gardens or ornamental plants, feeding deer or other wildlife, hunting deer or allowing deer to be hunted, erecting barriers to exclude deer, participating in community planning processes, etc. impact local deer movements and abundance, with consequences for themselves and their neighbors. Community leaders can influence human-deer conflicts with their decisions whether or not to use deer control programs, enact ordinances, involve and/or educate citizens, etc.

An effective public information effort is critical to the future success of Virginia's deer management programs. Public attitudes and perceptions often determine the success or failure of deer management.

Objective 1. To quantify agricultural, urban, ecosystem, vehicular, forestry, animal health, human safety, and other deer impacts by January 1, 2010.

A reliable estimate of deer damage to Virginia's agricultural producers has been lacking in the past. Traditionally, issuance of out-of-season crop depredation kill permits has been used to monitor deer agricultural damage demands on a county and statewide basis over time. Reliable data on deer-vehicle collisions, urban deer conflicts, and other deer damage is also lacking.

Strategies

a. Conduct surveys to monitor deer damage levels.

b. Determine acceptable levels of human tolerance to deer damage.

c. Develop a program, in cooperation with the Virginia Department of Transportation (VDOT), to accurately monitor deer-vehicle collisions on a management unit basis annually.

d. Conduct research on the effects of deer on ecosystem structure and diversity on a landscape basis over time.

e. Conduct research to assess the effects of nonhunted lands (refugia) on the incidence of deer damage.

Objective 2. To reduce agricultural damage, as measured by the demand for out-of-season kill permits for agricultural deer damage, to ≤ 1,000 permits annually through January 1, 2015.

As provided by Virginia State Statute §29.1-529. *Killing of deer or bear damaging fruit trees, crops, livestock or personal property or creating a hazard to aircraft,* the VDGIF is authorized to permit owners or lessees of land where deer are causing commercial or personal property damage to kill deer. Frequency of kill permit issuance for agricultural and urban/residential damage has increased over the last decade (Figure 19).

Strategies

a. Use hunting as the primary deer population damage management strategy.

b. Provide site-specific management programs (e.g., DMAP, DCAP, DPOP, kill permits).

c. Provide technical assistance to communities and landowners implementing deer management programs.

d. Develop educational materials for agricultural producers regarding deer damage abatement programs and techniques.

Objective 3. To continue a management program for urban deer through January 1, 2015.

Unhunted areas or refuges have become increasingly common over the last several decades. In these areas, traditional regulated deer hunting is often deemed inappropriate or unacceptable (e.g., urban/suburban areas, national parks, etc.). To meet deer management demands in these areas, alternative management strategies and/or management programs must often be implemented. Urban deer management issues are expected to increase significantly in the northern Piedmont and Tidewater regions as human populations continue to expand.

Strategies

a. Provide site-specific deer management programs (e.g., urban archery season, kill permits, DPOP). Expand programs to meet unaddressed needs in urban areas.

b. Provide technical assistance to communities and landowners implementing deer management programs.

c. Develop educational materials for the public regarding deer damage prevention and abatement techniques.

Objective 4. To implement a program to manage deer-vehicle collisions by January 1, 2010.

Although reliable, consistent data on deer-vehicle collisions in Virginia is lacking, it is currently assumed that the economic loss associated with deer-vehicle collisions and resulting damage is equal to or exceeds deer crop damage. In 2003, the total property damage reported from deer-vehicle collisions in Virginia was $13,443,412, or $2,530 per accident. Given that many accidents are not reported, the total property damage from deer-vehicle collisions actually is much higher. In addition to property damage, deer-vehicle collisions cause human injuries and fatalities. Annually during 1999-2003, an average of 2.2 fatal accidents and 384 injury accidents involved deer.

Strategies

a. Develop a program, in cooperation with the Virginia Department of Transportation (VDOT), to accurately monitor deer-vehicle collisions on a management unit basis annually.

b. Develop objectives for deer-vehicle collisions by management unit.

c. Educate community leaders and citizens, especially drivers, on techniques to reduce deer-vehicle collisions (e.g., news releases during the fall breeding season).

d. Ensure that development and road construction projects consider deer-vehicle collisions.

e. Support research on incidence and prevention of deer vehicle collisions in Virginia.

f. Assist VDOT with development of carcass disposal procedures that are environmentally safe, socially acceptable, practical, and cost effective.

Objective 5. To minimize deer-related diseases that impact humans and domestic animals through January 1, 2015.

Deer-related diseases known to affect humans include Lyme disease, erhlichiosis, babesiosis, rabies, brucellosis, and bovine tuberculosis (TB). TB, which also impacts cattle, has not been known to occur in Virginia since an isolated case was detected in captive fallow deer in Newport News in the early 1990s. The first three diseases listed above are tick-borne diseases that do not harm deer directly. As a host species for ticks, deer play a role in the maintenance of these diseases. Evidence indicates that higher deer densities promote higher incidences of these tick-borne diseases. Rabies is very rare in deer, but caution is warranted for anyone handling a suspect animal.

Hemorrhagic Disease (HD) does not affect humans. Cattle demonstrate resistance to the HD virus and only rarely show ill effects from infection. The “blue tongue virus,” the rarer form of HD, can cause a disease in domestic sheep similar to that in deer.

Chronic Wasting Disease (CWD) is in the same class of prion diseases as scrapie in sheep and bovine spongiform encephalopathy (“mad cow disease”) in cattle. However, there is no evidence at this time that humans have contracted such an illness from consuming venison, and CWD has not been shown to transmit to livestock in natural conditions. The susceptibility of exotic species of deer held in captivity (e.g., fallow, reindeer, axis, sika, muntjac) is currently unknown.

Brucellosis and foot-and-mouth disease are serious infectious livestock diseases that can infect deer and be transmitted by deer. Neither disease has been found in Virginia in deer or livestock.

Strategies

a. Educate public about human and animal health relating to deer in coordination with Virginia Department of Health and other appropriate agencies.

b. Discourage supplemental feeding and other activities which unnaturally concentrate deer to reduce risk of disease transmission.

c. Remove and test illegally-held captive deer for CWD, bovine tuberculosis, and other diseases as appropriate.

d. Regulate captive deer, including rehabilitated wild deer, to minimize risk of disease transmission to wild deer.

e. Prevent introduction of infectious diseases using regulations and policies.

f. Develop and update disease surveillance and response plans as needed.

Recreation Goal

Provide opportunities for all citizens to safely and ethically enjoy diverse deer-related recreational experiences and traditions (including observation and hunting) consistent with deer population and damage goals.

White-tailed deer are popular among wildlife watchers, hunters, and the general public. Between 1998-2000, more Virginians took a trip to view white-tailed deer than any other species in the wild. During the 2003-04 deer season, more than 240,000 Virginia deer hunters spent 3.5 - 4 million days afield in pursuit of deer. Deer hunting traditions include archery hunting, muzzleloader hunting, firearms hunting with dogs, and firearms hunting without dogs.

Recreational hunting demands have led to the development of programs designed to achieve hunter satisfaction while also achieving population management objectives. Public and hunter awareness of this important dual role of regulated hunting will be critical to successful deer management in the future.

Objective 1. To manage deer-related recreation to yield current levels of deer viewing opportunities through January 1, 2015.

According to the 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, observing and photographing wildlife contributed $789 million dollars to Virginia's economy. According to the House Bill 38 survey, 20% of all Virginians (including hunters and nonhunters) took a trip during 1998-2000 for the primary purpose of observing, photographing, or feeding wildlife. Of trips made by noncomsumptive users, more were made to view white-tailed deer (69%) than any other species.

Strategies

a. Identify nonhunting deer-related recreational demands using surveys and other methods.

b. Develop quantifiable objectives for nonhunting deer-related recreation.

c. Maximize recreational opportunities when feasible and acceptable.

d. Ensure that deer viewing and photography activities do not facilitate human-deer conflicts. Discourage feeding of deer.

e. Ensure that permitted captive deer exhibitors promote recreational viewing and educate visitors.

f. Educate public about nonhunting deer-related recreational opportunities

Objective 2. To reduce deer hunting related accidents by 25% by January 1, 2010.

In an ideal season, Virginia deer hunters have consistently ranked feeling safe in the field as their most important hunting satisfaction component. Existing programs can be evaluated and enhanced to improve hunter safety.

Strategies

a. Promote mandatory hunter safety certification for all deer hunters.

b. Evaluate current hunter education programs.

c. Cooperate with other agencies and organizations to deliver hunter safety information.

d. Emphasize safe use of tree stands.

e. Develop weapons safety instruction.

Objective 3. Consistent with deer population management objectives and the rights of all Virginia citizens, maintain an annual average of at least 420,000 hunter-days of archery deer hunting, 615,000 hunter-days of muzzloading deer hunting, and 1,400,000 hunter-days of general firearms deer hunting (with and without dogs) through January 1, 2015.

Traditionally, deer hunter numbers and days spent afield hunting have provided the most common measures of demand for deer management programs. Overall, hunter survey results indicate that the number of deer hunters has declined over the past 20 years. The objective listed above is designed to maintain diverse deer hunting recreation at current levels (based on an average of 2001 and 2004 hunter surveys). The number of hunters who do or do not use dogs during the general firearms season is currently unknown. Current deer hunter numbers and effort levels will be required to meet population management objectives specified in this plan.

Strategies

a. Identify recreational demands for deer hunting through hunter surveys, including demands by those who do and do not use dogs.

b. Maximize recreational opportunities when feasible and acceptable.

c. Maintain hunting recreation quality by preserving diverse types of hunting opportunities.

d. Manage the allocation of recreational opportunities among users.

e. Promote deer hunting among nontraditional groups.

f. Promote deer hunting among youth.

g. Educate public about deer hunting recreational opportunities

h. Support programs that provide additional incentives for hunters to continue hunting (e.g., Hunters for the Hungry).

Objective 4. To manage deer-related recreation to yield a statewide deer gun hunter satisfaction index (HSI) of greater than or equal to 4.0 (adequate) on both public and private lands in all regions annually through January 1, 2015.

While deer hunter numbers and hunting days provide some measures of hunting demand, recreational satisfaction is more complex and includes many other elements of the hunting experience. Hunter satisfactions involve multiple components of the hunting experience and include, but are not limited to: seeing deer and deer sign, being close to nature, being safe, seeing trophies, etc. Figure 18 summarizes some elements of satisfactions for Virginia deer hunters. Managing for specific components of hunting satisfaction can enhance the overall recreational experience. Gun deer hunter satisfactions in Virginia have been monitored with an index derived from annual hunter surveys. Favorable hunter satisfactions also will help retain deer hunting as an important and viable population management tool.

Strategies

a. Determine the relative importance and sensitivity of deer hunting satisfactions as they relate to the overall recreational experience.

b. Determine desirable attributes of quality deer hunting experiences (e.g., hunter density, specific characteristics of and demand for quality deer, access needs, etc.).

c. Provide diverse deer hunting experiences and opportunities to satisfy varied demands by deer hunters.

d. Educate public about different hunting opportunities that satisfy different recreational satisfactions.

e. Provide Quality Deer Management (QDM) opportunities.

Objective 5. To ensure that deer hunting methods in Virginia are fair and sportsmanlike.

The future of deer hunting will be affected significantly by public perception of deer hunters and deer hunting activities. Therefore, guidelines, regulations, and education pertaining to deer hunting should address concerns for ethics and fair chase.

Two fair chase issues that have been addressed already by Virginia law are baiting and hunting deer within high-fence enclosures. Use of corn, salt, or other food items to lure deer for hunting purposes is illegal. In 2001, the Virginia General Assembly enacted a moratorium on constructing or hunting behind fences that confine deer (§29.1-525.1), due largely to fair chase and wildlife ownership issues. The law permitted 5 deer hunting enclosures existing at the time of passage to continue in operation under guidelines developed and enforced by VDGIF.

Strategies

a. Describe deer hunting activities that are not considered fair or sportsmanlike based on surveys or other methods.

b. Develop and implement educational programs, regulations, guidelines, and recognition programs to encourage hunter ethics.

c. Maintain prohibition and strict regulation of existing deer hunting enclosures.

d. Maintain prohibition on use of bait to hunt deer.

e. Educate hunters and the general public about ethics in deer hunting.

Objective 6. To ensure that deer-related recreational activities are consistent with and respect the rights of private property owners and other Virginia citizens through January 1, 2015.

Under some circumstances, deer hunting or nonhunting deer-related recreational activities may create conflicts with landowners, other hunters, other outdoor recreationists, motorists, and other citizens. Potential for trespass exists for all forms of deer-related recreation, but most such incidents that are reported involve the use of dogs in hunting deer. Public concerns about hunting on or near roadways, the welfare of hunting dogs, and other issues related to hunting deer with dogs have increased in recent decades. Further, certain forms of deer hunting may not be acceptable in or near urban areas due to concerns for human safety and privacy. The future of deer hunting for population management, damage control, and recreational benefits depends on its compatibility with Virginia's citizens. Therefore, it is important that deer hunting activities be conducted in a manner that respects the values and concerns of landowners and other Virginia citizens.

Strategies

a. Using surveys and other methods, identify and describe deer hunting activities (e.g., when, where, type of hunting) that results in conflicts with landowners and other Virginia citizens.

b. Develop and implement educational programs, regulations, guidelines, and recognition programs to reduce conflicts between deer hunters and other Virginia citizens.

c. Foster dialogue between deer hunters and landowners who experience problems or nuisance from deer hunting dogs or deer hunters.

d. Educate landowners and hunters regarding dog retrieval laws and responsibilities of each party in preventing conflicts.

e. Educate hunters about the effect of hunting on other citizens.

f. Educate nonhunting deer recreationists about trespassing, feeding of deer, and other potential conflicts with landowners and other citizens.

Appendix 1 – Members of the Stakeholder Advisory Committee

Committee members

Dick Atkinson, Virginia Soybean Association
Ed Clark, Ph.D., The Wildlife Center of Virginia
Alvin Estep, Western Virginia Deer Hunters Association
Carol Hardy Croy, Ph.D., U. S. Forest Service
Brock Herzberg, Virginia Farm Bureau
Earl Hodnett, Faifax County Police Department
David King, Governor's Land (planned community)
Theresa Layman, Department of Conservation and Recreation, Division of State Parks
Margaret O'Bryan, Richmond Aububon
Ken Parr, Brandon Hunt Club
Greg Patton, Quality Deer Management Association
Denny Quaiff, Virginia Deer Hunters Association
Rob Burnham, Virginia Bowhunters Association
Jim Smith, Virginia Department of Transportation
Ken Smith, Hill City Master Gardeners Association
Shannon Wyatt, Maymont Park
Gary Youngblood, Virginia Forestry Association and MeadWestvaco

Appendix 2 – Deer habitat data for all counties and cities in Virginia based on 1992 satellite imagery from U.S. Geological Survey's National Land Cover Dataset

County or City	Total Area (mi^2)	Developed Area (mi^2)	Barren Area (mi^2)	Forest Area (mi^2)	Open Area (mi^2)	Wetland Area (mi^2)	Deer Habitat* (mi^2)	Deer Habitat (%)
Counties								
Accomack	455	8	8.9	155	147	136.8	439	96%
Albemarle	723	16	6.2	531	167	3.2	679	94%
Alleghany	445	5	2.1	411	25	0.2	436	98%
Amelia	357	1	11.0	253	82	9.7	345	97%
Amherst	475	7	5.5	396	66	0.5	462	97%
Appomattox	334	4	12.4	245	68	3.8	317	95%
Arlington	26	17	0.0	6	3	0.0	9	33%
Augusta	970	16	2.7	583	365	2.5	931	96%
Bath	532	1	1.8	484	40	1.1	526	99%
Bedford	755	9	3.6	521	219	0.5	740	98%
Bland	359	1	1.2	286	69	0.3	356	99%
Botetourt	543	9	3.8	426	101	0.8	528	97%
Brunswick	566	5	24.8	398	111	24.6	534	94%
Buchanan	504	2	7.9	486	8	0.0	493	98%
Buckingham	581	3	20.1	474	73	9.6	556	96%
Campbell	504	14	12.5	348	126	2.2	476	94%
Caroline	533	8	17.3	369	94	41.4	504	94%
Carroll	476	6	0.2	305	164	0.6	470	99%
Charles City	183	1	1.2	121	37	23.1	180	99%
Charlotte	475	2	10.7	328	107	26.1	461	97%
Chesterfield	426	48	9.7	316	45	7.1	368	86%
Clarke	177	1	0.4	72	103	0.8	176	99%
Craig	331	0	0.7	288	40	0.3	328	99%
Culpeper	381	7	4.4	201	167	1.0	369	97%
Cumberland	298	2	6.0	219	54	16.1	290	97%
Dickenson	332	1	7.3	312	11	0.0	323	97%
Dinwiddie	504	8	16.4	367	103	10.8	480	95%
Essex	258	3	5.7	153	75	20.6	249	96%
Fairfax	395	136	10.0	195	45	8.3	248	63%
Fauquier	650	18	3.8	336	292	0.4	629	97%
Floyd	381	1	1.0	253	125	0.7	379	99%
Fluvanna	287	3	9.7	222	48	4.6	274	95%
Franklin	692	7	2.9	510	170	0.7	680	98%
Frederick	415	7	3.4	259	144	0.5	404	97%
Giles	357	4	2.6	296	53	0.1	350	98%
Gloucester	217	4	1.4	143	42	26.3	212	98%
Goochland	284	4	5.4	202	62	9.6	274	97%

County or City	Total Area (mi^2)	Developed Area (mi^2)	Barren Area (mi^2)	Forest Area (mi^2)	Open Area (mi^2)	Wetland Area (mi^2)	Deer Habitat* (mi^2)	Deer Habitat (%)
Grayson	443	3	0.3	314	124	0.6	439	99%
Greene	157	2	0.8	113	40	0.3	130	83%
Greensville	295	4	10.8	144	80	56.6	280	95%
Halifax	819	8	20.1	557	194	38.9	789	96%
Hanover	473	24	5.9	272	139	27.9	439	93%
Henrico	238	67	3.9	99	50	17.2	166	70%
Henry	382	23	4.6	290	62	1.3	353	93%
Highland	416	0	1.3	332	82	0.5	414	99%
Isle of Wight	316	8	2.5	135	122	48.6	305	97%
James City	143	6	0.6	96	23	17.0	135	95%
King & Queen	316	2	3.3	220	65	25.7	311	99%
King George	180	5	2.3	117	43	12.1	172	96%
King William	275	2	5.0	165	71	30.2	267	97%
Lancaster	133	4	2.7	86	34	4.5	125	94%
Lee	437	3	1.1	342	90	0.4	433	99%
Loudoun	520	19	6.8	207	280	5.8	493	95%
Louisa	497	5	12.2	368	96	16.2	480	97%
Lunenburg	432	2	13.3	310	92	14.1	416	96%
Madison	321	3	0.9	210	106	1.0	266	83%
Mathews	86	2	1.0	43	17	21.8	81	95%
Mecklenburg	624	9	13.6	386	183	29.1	598	96%
Middlesex	130	3	1.1	79	39	7.3	125	96%
Montgomery	388	15	1.6	262	108	0.1	370	95%
Nelson	472	3	4.3	397	64	1.2	463	98%
New Kent	210	3	4.5	144	30	27.2	201	96%
Northampton	207	3	2.7	56	84	69.0	209	100%
Northumberland	192	4	2.6	116	60	6.2	183	95%
Nottoway	315	9	8.9	219	68	9.9	297	94%
Orange	342	5	4.9	211	118	2.4	332	97%
Page	311	9	1.2	217	84	0.5	243	78%
Patrick	483	3	2.4	386	90	0.6	477	99%
Pittsylvania	971	12	23.0	651	276	6.7	933	96%
Powhatan	261	2	4.7	191	51	11.9	253	97%
Prince Edward	353	4	3.8	257	69	16.3	343	97%
Prince George	266	8	5.8	188	59	5.5	252	95%
Prince William	338	41	11.4	202	82	3.3	286	85%
Pulaski	321	11	0.7	195	113	0.1	308	96%
Rappahannock	267	2	0.4	183	81	0.4	214	80%
Richmond	191	3	4.0	108	60	15.9	184	96%
Roanoke	251	18	1.6	196	34	0.2	230	92%
Rockbridge	600	7	2.3	429	159	0.8	588	98%

County or City	Total Area (mi^2)	Developed Area (mi^2)	Barren Area (mi^2)	Forest Area (mi^2)	Open Area (mi^2)	Wetland Area (mi^2)	Deer Habitat* (mi^2)	Deer Habitat (%)
Rockingham	851	18	2.2	516	312	1.2	770	90%
Russell	475	5	5.0	358	107	0.3	465	98%
Scott	537	3	0.2	471	63	0.7	535	100%
Shenandoah	512	13	2.5	318	175	0.7	494	96%
Smyth	452	11	0.5	333	107	0.3	440	97%
Southampton	604	7	3.1	239	239	115.5	593	98%
Spotsylvania	401	11	14.8	290	82	5.6	378	94%
Stafford	270	16	10.7	188	48	7.6	244	90%
Surry	279	1	6.2	168	69	33.9	270	97%
Sussex	491	5	12.8	310	101	61.3	472	96%
Tazewell	520	8	3.0	375	132	0.7	507	98%
Warren	214	10	1.2	145	56	0.5	180	84%
Washington	563	13	0.5	401	150	0.8	551	98%
Westmoreland	229	6	2.4	125	79	15.8	219	96%
Wise	404	9	25.7	351	16	0.7	367	91%
Wythe	463	9	1.9	249	202	0.3	452	98%
York	106	10	2.7	72	11	7.7	91	86%
Cities								
Alexandria	15.4	11	0.0	2	1	0.1	3	23%
Bedford	6.8	2	0.0	3	2	0.0	5	72%
Bristol	11.5	6	0.1	4	1	0.0	5	46%
Buena Vista	6.5	2	0.1	4	1	0.0	5	76%
Charlottesville	10	6	0.1	4	1	0.1	5	46%
Chesapeake	351	50	1.0	26	107	157.6	290	83%
Colonial Heights	7.8	4	0.6	2	1	0.8	3	40%
Covington	4.4	2	0.1	2	1	0.0	2	50%
Danville	43.9	19	0.6	18	5	0.3	24	54%
Emporia	6.7	2	0.0	2	1	0.9	5	68%
Fairfax	6.4	4	0.0	2	0	0.0	2	36%
Falls Church	2	1	0.0	1	0	0.0	1	32%
Franklin	7.7	2.5	0.1	2	2	1.2	5.2	68%
Fredericksburg	10.5	3	0.6	4	2	0.2	6	60%
Galax	8.1	3	0.1	3	2	0.0	5	60%
Hampton	59	27	1.2	10	7	4.7	22	37%
Harrisonburg	17.4	7	1.0	3	6	0.0	9	54%
Hopewell	10.9	6	0.7	3	1	0.1	4	35%
Lexington	2.5	1	0.0	1	1	0.0	1	47%
Lynchburg	49.4	17	0.3	26	6	0.1	32	65%
Manassas	10.1	6	0.4	1	2	0.0	3	32%
Manassas Park	1.8	1	0.0	1	0	0.0	1	36%

County or City	Total Area (mi^2)	Developed Area (mi^2)	Barren Area (mi^2)	Forest Area (mi^2)	Open Area (mi^2)	Wetland Area (mi^2)	Deer Habitat* (mi^2)	Deer Habitat (%)
Martinsville	10.9	6	0.0	4	0	0.0	4	41%
Newport News	69.2	29	2.0	23	6	5.9	36	52%
Norfolk	66.1	43	0.4	4	5	1.5	10	15%
Norton	7.6	1	0.6	6	0	0.0	6	79%
Petersburg	23.1	9	0.2	10	4	0.1	14	59%
Poquoson	20.8	1	0.4	4	1	8.2	13	64%
Portsmouth	46.1	21	2.9	3	3	2.3	8	18%
Radford	10.1	3	0.0	5	2	0.0	7	66%
Richmond	62.5	44	1.1	11	3	0.8	15	24%
Roanoke	42.4	24	0.6	12	6	0.0	18	42%
Salem	14.4	8	0.1	5	2	0.0	7	48%
Staunton	19.3	6	0.2	6	8	0.0	14	72%
Suffolk	429.4	21	7.6	112	134	126.2	373	87%
Virginia Beach	258.7	68	9.1	36	69	66.7	172	67%
Waynesboro	14	5	0.1	4	5	0.1	8	61%
Williamsburg	8.9	2	0.0	5	1	0.4	6	72%
Winchester	9.3	5	0.1	2	3	0.0	4	48%
STATE	39,675	1,393	586	26,245	9,710	1,582	37,732	94%

*Habitat = (Forest Area+ Open Area + Wetland Area – Shenandoah National Park area; latter not shown in table)

Appendix 3. Statewide deer-vehicle collision data, 1975-2004, obtained from Virginia Department of Transportation.

Year	Fatal Accidents[1]	Persons Killed[1]	Injury Accidents[1,2]	Persons Injured[1,3]	Property Damage Accidents[1,4]
1975	0	0	38	45	963
1976	1	1	49	71	1110
1977	2	2	48	62	1304
1978	0	0	61	87	1156
1979	0	0	64	86	1129
1980	1	1	67	78	1165
1981	1	1	76	89	1305
1982	0	0	77	96	1369
1983	0	0	93	103	1569
1984	1	1	103	127	1717
1985	0	0	136	167	1972
1986	2	2	169	206	2430
1987	0	0	186	214	2767
1988	0	0	170	206	2637
1989	1	2	177	205	2563
1990	3	3	204	242	3220
1991	2	2	199	231	[1741][4]
1992	1	1	220	272	[268]
1993	1	1	221	264	[239]
1994	1	2	227	264	[196]
1995	1	1	249	308	[204]
1996	3	3	285	332	[239]
1997	2	2	308	354	[313]
1998	1	1	367	422	3656
1999	4	4	369	439	3518
2000	2	2	350	410	3825
2001	4	4	447	521	4887
2002	1	1	372	424	4566
2003	0	0	382	450	5314
2004	1	1	407	456	5105

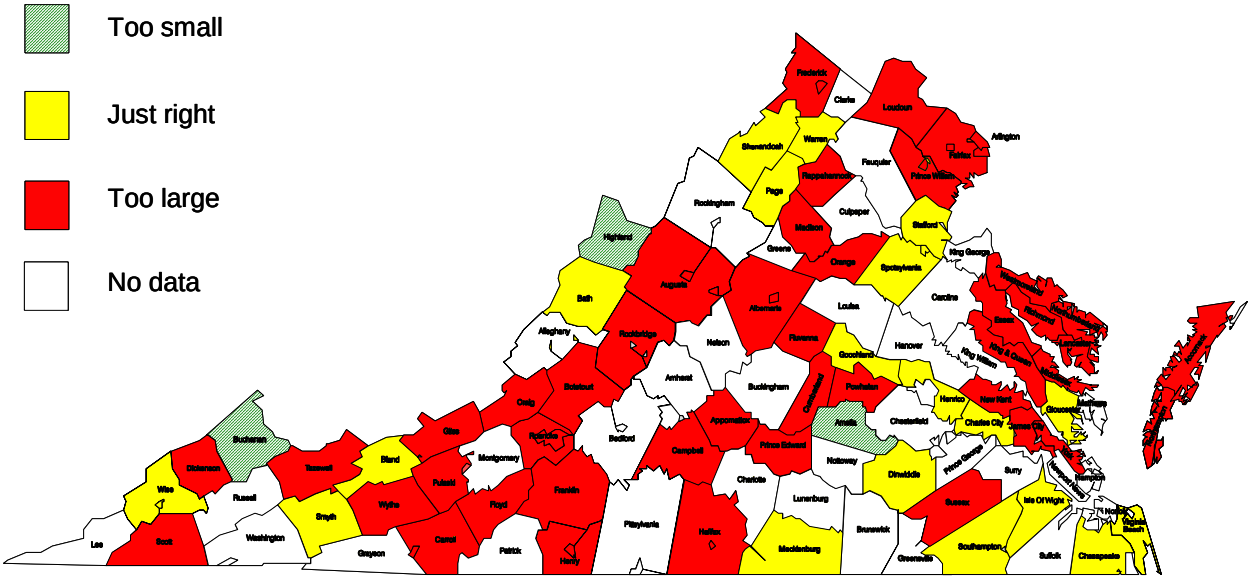
[1] Data reported by investigating law enforcement officers. Data cannot be used in discovery or as evidence in a Federal or State court proceeding or considered for other purposes in any action for damages against VDOT or the State of Virginia.
[2] Accidents involving deer with no persons killed but at least one person injured.
[3] Persons injured in fatal and injury crashes.
[4] Accidents involving deer with no persons killed or injured but with damage to vehicles or other property (report not required for property damage crashes less than $1000). Data for 1991-1997 were not used in this report due to a change in methodology.

Appendix 4. Opinions about deer population size expressed by parents of high school children participating in a deer education project during Spring 2005.

		Deer Population Size*			
County/City	**Responses (n)**	**Too Small (%)**	**Just Right (%)**	**Too Large (%)**	**Mean**
Northern Virginia cluster					
Arlington	57	18	63	18	2.00
Clarke	45	0	33	60	2.64
Fairfax County	21	10	62	29	2.19
Fauquier	49	4	49	45	2.42
Loudoun	68	3	60	34	2.32
Prince William	80	20	56	21	2.01
TOTAL	*320*	*10*	*54*	*33*	*2.23*
Roanoke/Montgomery area cluster					
Botetourt	11	0	27	55	2.67
Montgomery	123	6	37	53	2.50
Roanoke County	153	8	54	32	2.25
TOTAL	*287*	*7*	*45*	*42*	*2.37*
Richmond area cluster					
Chesterfield	69	4	72	17	2.14
Hanover	36	6	56	33	2.29
Powhatan	66	15	47	36	2.22
TOTAL	*171*	*9*	*59*	*28*	*2.20*
Miscellaneous counties					
Augusta	105	27	48	25	1.98
Campbell	86	6	49	42	2.37
Richmond County	48	15	46	35	2.22
Cities					
Franklin	43	16	60	19	2.02
Hopewell	79	34	57	5	1.70
Manassas	35	14	63	23	2.09
Poquoson	75	13	72	11	1.97
Portsmouth	41	22	68	7	1.85
STATE TOTAL	*1290*	*13*	*54*	*30*	*2.18*

* Percent and mean responses to: “Overall, I think the deer population in my area is,” 1. too small, 2. just right, 3. too large

Appendix 5. Opinions of county/city administrative officials about how they believe their residents consider the deer population (too small, just right, or too large) during 2005.



Appendix 6. Annual expenditures for the Virginia Department of Game and Inland Fisheries deer program, fiscal years 1999-2004 (FY99-FY04).

		Annual Expenditures ($)					
		FY99	**FY00**	**FY01**	**FY02**	**FY03**	**FY04**
DEER	Personnel Costs	284,190	313,395	292,617	254,690	215,824	289,315
	Travel Expenses	10,526	7,613	8,428	7,371	5,510	8,626
	Vehicle Expenses	22,188	23,864	20,951	18,134	17,122	23,771
	Supplies & Equipment	18,787	19,071	25,103	20,342	18,780	30,208
	Total	**335,691**	**363,942**	**347,099**	**300,538**	**257,236**	**351,919**
CWD*	Personnel Costs					205,007	26,816
	Travel Expenses					5,855	748
	Vehicle Expenses					31,589	2,802
	Supplies & Equipment					33,414	19,367
	Total	**0**	**0**	**0**	**0**	**275,864**	**49,733**
ANNUAL TOTAL		**335,691**	**363,943**	**347,099**	**300,538**	**533,100**	**401,652**

*CWD = Chronic wasting disease surveillance; emergency funding FY 2003 and federal funding FY 2004

Appendix 7. Human population estimates, densities, and growth rates for Virginia cities and towns.

County or City	Human Population (2005)*	Population Density (people/mi^2)	Population Growth Rate (%, 2000-2005)
Counties			
Accomack	39,100	86	2.1
Albemarle	90,400	125	7.4
Alleghany	17,200	39	0.0
Amelia	12,100	34	6.1
Amherst	31,900	67	0.0
Appomattox	13,900	42	1.5
Arlington	195,600	7,523	3.2
Augusta	68,900	71	5.0
Bath	4,900	9	-2.0
Bedford	63,600	84	5.3
Bland	7,100	20	2.9
Botetourt	31,800	59	4.3
Brunswick	18,400	33	0.0
Buchanan	25,300	50	-6.3
Buckingham	16,200	28	3.8
Campbell	51,300	102	0.4
Caroline	24,300	46	9.9
Carroll	29,700	62	1.7
Charles City	6,800	37	-1.4
Charlotte	12,700	27	1.6
Chesterfield	286,500	673	10.2
Clarke	13,900	79	9.5
Craig	5,100	15	0.0
Culpeper	41,200	108	20.1
Cumberland	9,500	32	5.5
Dickenson	16,500	50	0.6
Dinwiddie	25,800	51	5.3
Essex	10,300	40	3.0
Fairfax	1,022,100	2,588	5.4
Fauquier	62,900	97	14.1
Floyd	14,800	39	6.5
Fluvanna	24,900	87	24.4
Franklin	50,100	72	5.9
Frederick	67,600	163	14.2
Giles	16,500	46	-1.2
Gloucester	35,700	165	2.6
Goochland	19,300	68	14.2
Grayson	16,600	37	-1.8

County or City	Human Population (2005)*	Population Density (people/mi^2)	Population Growth Rate (%, 2000-2005)
Greene	16,900	108	11.2
Greensville	12,300	42	6.1
Halifax	36,700	45	-1.9
Hanover	95,100	201	10.2
Henrico	283,300	1,190	8.0
Henry	55,100	144	-4.8
Highland	2,400	6	-3.9
Isle of Wight	32,200	102	8.4
James City	56,600	396	17.7
King & Queen	6,900	22	4.5
King George	20,000	111	19.0
King William	14,400	52	9.9
Lancaster	11,500	86	-0.9
Lee	25,300	58	7.2
Loudoun	252,300	485	48.8
Louisa	28,700	58	12.1
Lunenburg	13,100	30	0.0
Madison	13,500	42	8.0
Mathews	9,400	109	2.2
Mecklenburg	32,600	52	0.6
Middlesex	10,200	78	3.0
Montgomery	87,900	227	5.1
Nelson	15,000	32	4.2
New Kent	15,700	75	16.3
Northampton	13,200	64	0.8
Northumberland	12,900	67	4.9
Nottoway	15,800	50	0.6
Orange	29,300	86	13.1
Page	24,000	77	3.5
Patrick	19,400	40	0.0
Pittsylvania	61,800	64	0.2
Powhatan	25,800	99	15.2
Prince Edward	20,400	58	3.5
Prince George	36,900	139	11.5
Prince William	355,300	1,051	26.5
Pulaski	34,400	107	-2.0
Rappahannock	7,000	26	0.0
Richmond	9,500	50	7.9
Roanoke	90,000	359	4.9
Rockbridge	21,500	36	3.4
Rockingham	71,600	84	5.8
Russell	29,100	61	-0.7

County or City	Human Population (2005)*	Population Density (people/mi^2)	Population Growth Rate (%, 2000-2005)
Scott	23,600	44	0.9
Shenandoah	38,900	76	10.8
Smyth	32,300	71	-2.4
Southampton	17,900	30	2.3
Spotsylvania	114,000	284	26.1
Stafford	117,300	434	26.9
Surry	6,900	25	1.5
Sussex	12,000	24	-4.0
Tazewell	44,100	85	-1.1
Warren	34,300	160	8.5
Washington	52,100	93	2.0
Westmoreland	16,700	73	0.0
Wise	41,700	103	-1.2
Wythe	27,700	60	0.4
York	62,100	586	10.3
Cities			
Alexandria	135,200	8,779	5.4
Bedford	6,200	912	-1.6
Bristol	17,400	1,513	0.0
Buena Vista	6,500	1,000	3.2
Charlottesville	39,900	3,990	-0.5
Chesapeake	213,400	608	7.1
Colonial Heights	17,300	2,218	2.4
Covington	5,800	1,318	-7.9
Danville	46,400	1,057	-4.1
Emporia	5,500	821	-3.5
Fairfax	22,700	3,547	5.6
Falls Church	10,800	5,400	3.9
Franklin	8,400	1,091	1.2
Fredericksburg	21,200	2,019	9.9
Galax	6,900	852	1.5
Hampton	145,500	2,466	-0.6
Harrisonburg	43,500	2,500	7.4
Hopewell	22,500	2,064	0.9
Lexington	7,000	2,800	1.5
Lynchburg	68,000	1,377	4.1
Manassas	36,700	3,634	4.6
Manassas Park	13,100	7,278	27.2
Martinsville	14,700	1,349	-4.5
Newport News	182,200	2,633	0.8
Norfolk	235,500	3,563	0.5

County or City	Human Population (2005)*	Population Density (people/mi^2)	Population Growth Rate (%, 2000-2005)
Norton	3,900	513	0.0
Petersburg	31,300	1,355	-7.1
Poquoson	11,900	572	2.6
Portsmouth	98,800	2,143	-1.8
Radford	15,500	1,535	-2.5
Richmond	193,300	3,093	-2.3
Roanoke	93,600	2,208	-1.4
Salem	25,100	1,743	1.6
Staunton	23,100	1,197	-3.4
Suffolk	77,100	180	21.0
Virginia Beach	435,600	1,684	2.4
Waynesboro	20,000	1,429	2.6
Williamsburg	13,400	1,506	11.7
Winchester	25,700	2,763	8.9
STATE	7,567,500	191	6.9%

* Projections from Weldon Cooper Center for Public Service, University of Virginia